SEWAGE DISPOSAL
EXPERIMENTS

GLOVERSVILLE, N. Y.

Report

to the

Common Council

of the

City of Gloversville, N. Y.

on

Sewage Purification Experiments

and

Sewage Disposal

by

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AND

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Gloversville, N. Y., Aug. 7, 1909

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August 7, 1909.

To the Honorable Mayor and City Council
of the City of Gloversville, N. Y.

Gentlemen,—

In conformity with various resolutions and orders passed by your honorable body, the problem of sewage disposal at Gloversville has been made the subject of an exhaustive study, involving making many measurements and analyses and carrying out experiments upon several methods of purification for the period of nearly one year. These investigations have proceeded sufficiently far to enable your engineers to answer many of the questions relating to the purification of the sewage which arose at the time the problem was first pretsented. Accordingly, the following report has been prepared covering the measurements, analyses and studies which have been made.

To enable you at the outset to gain a general idea of the subject matter of this report and the conclusions drawn from the various studies, a resume of the various subjects herein discussed is here presented.

RESUME OF STUDIES.

The population of the City of Gloversville is estimated at about 20,000 at the present time. The city has provided a system of sewers which fairly well accommodates the present population. In 1903 it was estimated that nearly 16,000 people or 80% of the population were served by the sewers. In addition to the domestic sewage from this population, the sewers also receive, at the present time, the industrial wastes from about twenty tanneries, or skin mills, engaged in the manufacture of fine grades of leather. Since the establishment of the skin mills and the building of the intercepting sewer, all of the sewage and the mill wastes have been discharged into Cayadutta Creek, a small stream passing through the center of the city. The dilution afforded by the creek is as low in the dry season as one part of sewage to two parts of creek water.

The condition of the waters flowing in the creek below the city became so bad that litigation was instituted in 1899 by riparian owners, for the purpose of collecting damages and obtaining an injunction against the City of Gloversville to prohibit the discharge of sewage into the creek. This action brought the city face to face with the problem of sewage disposal, which has been in litigation and under investigation from that date to the present time.

Realizing the ultimate necessity of purifying the sewage, the city early began the construction of surface water drains so as to provide separate channels for storm water and for sewage. This work has progressed well, although at the present time there are 3.6 miles of combined sewers which receive surface water as well as sewage. There are also a large number of houses, the roofs of which discharge storm water into the sewers connected with the intercepting sewer. It is very important that the separate system of sewers and drains be early completed and that the connections from the

roofs referred to be so altered as to exclude from the sewer system the storm water collected by them. The separate system now comprises 28.6 miles of sewers.

Several methods of purifying the sewage were available to the city and are explained and discused in detail in this report. These methods are designated as follows:

Septic Tank Treatment.
Sedimentation.
Sedimentation of Sprinkling Filter Effluent.
Filtration through Sprinkling Filters.
Intermittent Filtration of Sprinkling Filter Effluents through Sand.
Intermittent Filtration of Crude Sewage through Sand.

Some of these methods are preparatory or partial in their nature, so that only three independent and complete methods have been investigated. These are—

First: treatment of sewage by septic process or sedimentation, followed by filtration through sprinkling filters, followed in turn by sedimentation.

Second: the same method as above described with additional intermittent filtration of the effluents through sand.

Third: intermittent filtration of crude sewage through sand filters.

There were three main reasons for undertaking the experimental studies described in this report:

1. The determination of the charactetr of the industrial wastes produced at the individual tanneries and the methods which might be available for reducing to a minimum their injurious effects upon any process of purification which might be adopted.

2. Gloversville is so situated that the climate is cool throughout most of the summer, and very cold during the winter, which season may be considered as including four months of the year. The organisms required for the purification of the sewage do not thrive at low temperatures, consequently it became a matter of grave doubt whether the temperature at Gloversville was not sufficiently low to prevent the successful action of these organisms.

3. The several methods of purification are all dependent, in at least one stage of the process, upon the action of living organisms. These organisms require certain conditions of environment, without which it is impossible for them to live and do their work. Certain chemicals known to be present in the wastes from the Gloversville mills, are injurious to them, and if present in sufficient quantities would actually sterilize the sewage and prevent any biological action whatever. The wastes from so many tanneries, mingled with the sewage from such a comparatively small population, produces a sewage containing large quantities of chemicals, the exact effect of which upon the living organisms could not be determined without special study and experimental work.

The several tanneries treat annually about 9,000,000 lbs. of skins and use in their work about 8,000,000 lbs. of chemical reagents and other substances. Large quantities of refuse from the skins, and from the inert portions of the chemical reagents, as well as dye-stuffs and some of the active agents in the spent liquors together with wash waters, constitute the mill wastes. Although large portions of the solid waste matters from the tanks are taken

to the hair mill and there treated to recover the hair, yet the analyses of the creek water indicate that the dry matters finding their way into the creek at the time the analyses were made, and now discharged into the mill settling tanks, amount to as much as 30,000 pounds per day. A large portion of this material is insoluble in water, and consequently leaves the tanneries suspended in the liquid wastes. If such materials are turned into the sewer it is probable that they will cause serious trouble by the formation of deposits. In addition to the danger of forming deposits in the sewer and thus eventually choking it or requiring removal at large expense, these substances would prove a serious burden to the sewage disposal works. After making careful studies of the various phases of this problem, it was decided that the wisest course was to require each mill to install a settling tank and pass the mill wastes through such tanks before allowing them to enter the intercepting sewer. Accordingly tanks have been built at the various tanneries, and have been in use throughout a large portion of the time covered by the work at the experiment station. Most of the tanks were built in 1907.

In 1908, the City Council passed an ordinance requiring the construction of such tanks, providing for their inspection and cleaning from time to time, and stipulating that in the future the tanks should be modified, as directed by the City Council, to meet the requirements of the sewage disposal plant.

These tanks have been inspected at intervals and reports made to the various owners upon the conditions found. In some cases the tanks have been promptly cleaned when inspection proved that such actions was necessary, but in other cases there has been considerable delay. Some of the tanks fill with sludge in a very short time, and delay in cleaning results in a large portion of such matter passing over into the sewer. The importance of securing the prompt removal of the sludge from the tanks cannot be too strongly urged, and steps should be taken to insure such action.

The removal of suspended matted effected by some of the tanks has run as high as 90%. If this degree of efficiency could be maintained the effluents would all pass the standard of 300 parts per million of suspended matter. On many occasions this degree of efficiency has not been reached and the sus-suspended matter in the millwastes has not been removed in many cases even to the extent of 70%, which is a very conservative standard under all conditions. It would seem wise to so inspect and require the cleaning of the tanks as to maintain in the future a removal of at least 70% of the suspended matter in the mill wastes, and if possible to secure effluents from all mills which should contain no more than 300 parts of suspended matter per million. The amount of sludge actually retained in all of the tanks, calculated on the basis of 10% solid matter, amounted to about 25,800 pounds per day at the time the test analyses were made. Had the efficiency of the tanks been sufficient to remove 70% of the suspended matter, this quantity would have been increased to over 33,800 pounds. Obviously the quantity represented by the difference between these figures found its way into the sewers.

The sludge produced at the various mill tanks varies greatly in density, some of it containing as much as 30% solid matter. In general, the sludge produced at those tanneries where large quantities of lime are used is heavier and more dense than that produced at other tanneries where aluminum salts are the chief chemicals used. The nitrogenous matter in the sludge is in general rather low, while the fats are comparatively high, reaching in one case as high as 32%. The sludge removed from the tanks by the mill owners

is mostly wasted, there being comparatively little demand for this material for use as a fertilizer and no other method of utilizing it has been tried.

When it is considered that in some years the minimum temperature falls to 10° Fahr. or less, on over 50 days, and to 0° or below on over thirty days, and that the average snowfall is about 88 inches per year, it will be realized that the climatic conditions under which a sewage disposal plant must operate are unusually severe. The winter of 1908-09 was, however, much milder than many of those during which the records of temperature have been kept, and in considering the experimental work due weight should be given to this fact.

Had there been sufficient time to carry on these experiments during several winters, it would have been very desirable to do at least one winter's work without any protection from the weather. Since it was impracticable, however, to carry on the experiments through more than one winter, it was decided to protect the various tanks and filters, with one exception, by means of a wooden building, so that the various questions under investigation might be studied throughout the winter season without interruption, even though the results obtained were influenced to some extent by the warmer temperature of the air surrounding the filters. The effect of housing the filters was to produce about them a very uniform temperature, almost invariably above the freezing point.

The temperature of the crude sewage delivered to the experiment station was somewhat lower than that which has been recorded at several other cities in this country where the sewage problem has received careful study. A comparison of the temperatures of the sewage at Waterbury, Conn., with those at Gloversville, show that the latter were from 3° to 4° lower during the winter, but that during the summer and fall months there was a much greater difference, the Gloversville sewage during the month of September being 12° colder than that of Waterbury.

The results of the measurements of the quantity of sewage delivered by the intercepting sewer since the establishment of the experimental station may be summarized as follows:

Average daily flow	2,600,000	gallons
Average flow for holidays	2,320,000	"
Maximum flow for single day	7,500,000	"
Maximum rate of flow	10,200,000	"
Wastes from tanneries and hair mill not connected with sewers	300,000	"

From these measurements it is evident that the plant as at first installed must be capable of treating an average of at least 3 million gallons per day, and that it must be able to take a maximum flow at least as great as 7,500,000 gallons for a single day. It is further important to note that as much as 3,500,000 gallons per day may be received for a period of two weeks, and that as much as 5,000,000 gallons per day may be received for a period of one week. The effect of the admission of surface water to the sewers is emphasized by a consideration of the flow during the months from July to November inclusive, when the average did not exceed 2,000,000 gallons per day. It should also be noted that provision must be made for receiving the sewage at a maximum rate of 10,200,000 gallons, although the period during which the flow is so great will probably be very short.

The mill sewage at present contributed to the sewers has been found to constitute about 25% of the total flow of sewage. About two-thirds of this

is discharged between the hours of 6 A. M. and 6 P. M. The maximum quantity of mill wastes discharged during one hour was found to be about 65% of the quantity of domestic sewage discharged during the same hour, or about 40% of the quantity of mill wastes and sewage combined.

The sewage finds its way quickly through the system of sewers and the intercepting sewer, and reaches the experiment station in a fresh condition. On account of the comparatively short distance through which the sewage flows and the fact that no pumping is required, the suspended matter is not disintegrated as much as is frequently the case in other places. During times of storm the addition of surface water causes a large increase in the amount of mineral matter in suspension. There appears to be about twice as much suspended matter in the sewage of Gloversville as in that of other cities in this country where similar studies have been made.

All of the sewage which has been pumped to the experimental tanks and filters has been passed through coarse screens. Experiments were made to determine the amount of labor required to care for the screens, and the quantity of screenings which would be removed therefrom if the entire flow of sewage were screened. The results of these experiments indicate that from 17 to 47 lbs. of screenings would be removed from each million gallons of sewage, and that the services of one man would be required constantly throughout the forenoon and at frequent intervals during the afternoon to keep the screens free unless automatic mechanic devices should be provided. It was also found that under ordinary conditions the screens would require no attention at night. In view of the fact that any preliminary process which may be adopted will involve the use of tanks, it is believed that thorough screening is not only unnecessary, but should be avoided as involving additional and useless expense,—only such screening being done as may be necessary to protect valves and machinery. Provision should be made, however, for the installation of screens at some future time, should any changes in the plant or in the character of the sewage make preliminary screening necessary.

The presence of considerable storm water at times and the large quantities of lime, bits of leather and other solid matters from the tanneries which are present on all of the working days of the week, led to the feeling that grit chambers might be a necessary feature of the proposed disposal plant. Accordingly, an experimental grit chamber was built. The experiments led to the conclusion that it was unwise to provide a chamber so large that large quantities of organic matter would be precipitated in it, and that if the chamber were reduced in size sufficiently to prevent such precipitation, the amount of material retainted therein would be insignificant. It is, therefore, believed that the construction of grit chambers as a feature of the proposed disposal works is unnecessary, provided suitable settling tanks are constructed and efficiently maintained at the various tanneries and mills producing wastes containing suspended matter. In addition it might be well to state that until all the surface water is separated from the sewage, catch basins should be provided to prevent large quantities of street detritus from reaching the sewers.

The unusually large quantity of suspended matter in the sewage of Gloversville indicated at the outset that any method of treatment would require, as a preparatory part of the process, the removal of such matters. This may be effected in three ways,—by chemical precipitation, plain sedimentation, or the septic process. The large quantity of lime and sulphate of alumina pres-

is mostly wasted, there being comparatively little demand for this material for use as a fertilizer and no other method of utilizing it has been tried.

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ent in the tannery wastes give the sewage a natural chemical treatment, and perhaps assist to some extent in precipitating the suspended matter. The large quantity of sludge produced by sedimentation of the sewage in its natural state prevents the consideration of the addition of any further quantities of chemicals for the purpose of deriving a greater benefit from the process of sedimentation.

Experiments with septic and sedimentation tanks have been conducted, and the results indicate that the quantity of suspended matter in the sewage can be reduced on the average to about 80 parts per million by the sedimentation process and 100 parts by the septic treatment. The action of the two tanks does not appear to differ materially, as shown by the analyses of the respective effluents. There is obviously more bacterial growth and action in the septic tank than in the sedimentation tank. This fact is reflected in a slight but apparently unimportant difference in chemical composition of the effluents.

The quantity of sludge produced by the septic tank at Gloversville is much larger than that produced by most of the other septic tanks of which records are available. At Worcester, during one series of large scale experiments, the quantity of sludge actually removed from the tanks per million gallons was 1.5 cubic yards, whereas that produced at Gloversville was 4.1 cubic yards in summer and 4.9 cubic yards in winter. The difference in the quantity of sludge produced is even more apparent when the dry solids contained in it are considered. In the case of Worcester, the quantity of dry solid matter in the sludge amounted to 354 ℔s. per million gallons, whereas in Gloversville in summer it amounted to 569 ℔s. and in winter to 1656 ℔s. Based upon the best information obtained from the experiments, it appeared that only about 50% of the solid matter removed from the sewage by the septic tank was removed from the tank in the form of sludge, the balance having disappeared.

The quantity of sludge produced by the sedimentation tank averaged 6.07 cu. yds. per million gallons. This quantity is somewhat smaller than that produced at Worcester during the large scale experiments, although the actual quantity of dry solid matter was considerably greater than that produced at Worcester during a portion of the experiments. The quantity of sludge was also much greater than that produced by the experimental tanks at Columbus, Ohio, and considerably smaller than that reported from Andover, Mass., for the years 1905 and 1906.

The quantity of sludge produced by the septic and settling tanks during the experiments was as follows:

The quantity of sludge by the sedimentation tank averaged 6.07 cubic

	Septic Tank Cu. Yds. per Mil. Gals.	Settling Tank. Cu. Yds. per Mil. Gals.
Summer Period....................	4.1	7.50
Winter "	4.9	5.01
Weighted average.............	4.5	6.07

On this basis, and assuming that the periods covered by these experiments each represent fairly one-half of the year, which is approximately correct, it appears that the quantity of sludge produced by the two processes

was 4.5 and 6.07 cubic yards, respectively, per million gallons. In other words, the quantity of sludge produced by the septic process was only about 74% as great as that obtained by sedimentation. This, then, may be said to be the only advantage of the septic process over simple sedimentation which was evident from these experiments. To offset this there is the decided disadvantage of the tendency toward an increased amount of suspended matter in the effluents from the septic tank, especially during the warmer weather, when gas is generated in the sludge and causes frequent upheavals from the bottom of the tank, thus distributing large quantities of solid matter through the water passing through it.

The experiments with the sprinkling filter have demonstrated that it is possible by this process to treat the effluent from the septic tank, or that from the settling tank, in such a manner that the effluent from the filters, after the removal of the suspended matter which it contains, will not undergo sufficient decomposition to cause putrefaction. The filter which was 10 feet in depth produced a better effluent at all times than any of the other filters, although the indications were that a greater quantity of suspended matter was being stored in its pores than in those of the shallower filters.

The effluent from the filter which was 7 feet in depth, although inferior to that from the 10 foot filter, was considerably better, especially during the earlier portion of the experiment, than that from the filters five feet deep. The filters 5 feet in dept so removed and changed the character of the organic matter of the influent that when all the suspended matter in the effluent was removed, it did not undergo sufficient decomposition to cause putrefaction. **Roughly, it may be stated that with the application of a uniform quantity and quality of influent to the various filters, the effluents were of a quality proportional to the depth of the filter.**

It is probable that all of the sewage of the city could be treated upon filters ten feet in depth and the effluent produced turned directly into the creek without causing the creek water to become putrescent under ordinary conditions. Occasionally, however, large quantities of the suspended matter stored in the filter will be discharged with the effluent, and at such times it would be very desirable to pass the water through a settling basin to prevent such matters from entering the creek. If the sewage should be treated upon filters 7 feet in depth, it would be advisable at all times to remove the suspended matter from the effluent before its discharge into the creek. Should the sewage be filtered through filters 5 feet in depth, it would be necessary to remove the suspended matter discharged by the filter, before turning the effluent into the creek to prevent putrefaction.

None of the filters have discharged as much suspended matter as was present in the influent applied to them. The experiments have not been continued long enough to establish definitely the relation between the suspended matter in the influent and effluent, although if conclusions must be drawn at the present time, they would be to the effect that there was a substantial storage of suspended matter in the pores of the filters. To what extent this can be washed out by flushing has not been determined, because of the danger of interfering with the natural work of the filters. It is probably wise, however, to count on the ultimate necessity of digging over and washing the filtering material, perhaps as often as once in ten years. It is hoped that this will not be necessary, as provision can be made for flushing and washing the

beds, in situ which may be sufficient to maintain the necessary proportion of air space.

Recognizing the necessity of removing a portion of the suspended matter from some of the sprinkling filter effluents before they are discharged into the Cayadutta Creek, experiments were instituted to show the results which could be accomplished by such sedimentation and to determine the quantity of sludge which would be produced. From these experiments it appears that it will be entirely practicable to remove the suspended matter from sprinkling filter effluents to such an extent as to admit of turning the effluents from filters ten feet or seven feet in depth directly into the creek after settling. The effluents from the filters five feet in depth, after the reduction of the suspended matter by settling, to 30 parts per million, were non-putrescible during a large portion of the time covered by the experiments, even though undiluted with clean water corresponding to the dilution which can be furnished by the natural flow of the creek. In some localities it might be possible to discharge the settled effluent from filters five feet in depth into a stream of this size, provided the best of care be given at all times to the purification plant. Under the local conditions, however, giving due consideration especially to the decree of the court, it is probable that it would be wise to supplement the treatment of the sewage upon such shallow filters by a further filtration through sand.

The sedimentation of the effluent from the sprinkling filters will result in the production of more or less sludge, which must be removed from the basius at frequent intervals. The quantity of sludge obtained from the effluents of the experimental filters was from 2 to 3 cubic yards per million gallons. It is reasonable to provide for a somewhat greater production of sludge from the proposed plant, because of the fact that considerable suspended matter was being stored in the filters, some of which undoubtedly would be washed out in the future and tend to increase the average quantity of sludge produced.

The experiments indicate that it is entirely practicable to filter the effluent from the sprinkling filters, after passing through the sedimentation basins, upon sand filters, at a rate of one million gallons per acre per day. The effluent from the experimental sand filter was always of an excellent character and no exception could possibly be taken to the discharge of the entire flow of sewage of the City of Gloversville into the Cayadutta creek, were it purified to this extent.

The experiments with the filtration of crude sewage upon a sand filter indicate that while it was possible to purify the sewage in this way, the large quantities of suspended matter and the very small volume of sewage which could be filtered per acre, made it impractical. Were this method to be adopted, it would be necessary to employ a large amount of labor to clean the surface of the beds. Such cleaning would be necessary on very frequent occasions, but could not be done during the four months of the winter, during which season the beds would probable be out of use.

No experiments were made upon the filtration of the effluent from the septic tank, or settling tank, upon sand filters. Undoubtedly this preparatory treatment would greatly reduce the amount of labor required for cleaning the surface of the filters. On the other hand, these effluents contain comparatively large quantities of suspended matter, which would interfere with the rapid filtration of the sewage, especially in winter. Under all the conditions,

it does not seem that intermittent sand filtration alone, or in combination with preparatory tank treatment, is a practicable method for the treatment of the sewage of Gloversville.

The various questions which have arisen from time to time have been grouped into eight classes, on page 19 of this report, and may be answered as follows:

1. The sewage of Gloversville is of such a character as to permit of successful purification by biological processes. The effect of the chemicals from the mill tanks, while doubtless diminishing the efficiency of the germs, does not prevent their carrying out their work to ultimate completion.

2. The winter climate at Gloversville is very unfavorable to biological processes of purification, and while it may be possible to operate the plant without protection from the cold, the success of such an undertaking appears to be somewhat doubtful. If the filters should be covered, there would be no doubt about their successful operation during the winter.

3. The sewage can be purified at the rate of one million gallons per acre daily upon sprinkling filters, in spite of the chemicals in the sewage, its strength, and the low temperatures during the winter months. It will, therefore, be necessary to provide three acres of filters for the average flow of sewage and provision must also be made for a greatly increased flow during short periods of time.

4. It has been demonstrated that in some cases it is possible to remove 90% of the suspended matters in the mill wastes, by means of the tanks already constructed. This, however, may be considered too high a standard. A very conservative standard will be 70%, although many of the tanks have not reached as high an efficiency even as this. With the tanks already built and operated as they have been during the past months, the sewage contains at least twice as much solid matter as ordinary city sewage and will be correspondingly difficult to treat.

5. If sedimentation should be adopted as a preparatory method of treatment, about 7 cubic yards of sludge will be produced per million gallons of sewage, or 7665 cubic yards per year, based upon an average flow of three million gallons per day. (This quantity includes wastes now discharged into the creek). This quantity of sludge must be removed from the tanks as frequent intervals and disposed of in some manner. The amount may be reduced by allowing the sludge to accumulate in the tanks and undergo more or less decomposition, thus changing the method to the septic process. The reduction which can be effected in this way will amount to approximately 30%.

To this quantity of sludge produced by preparatory sedimentation, should be added that produced by secondary sedimentation of the filter effluent, which will amount to approximately 3 cubic yards per million gallons of sewage treated, making a total of 10950 cubic yards per year, or 30 cubic yards per day.

6. No incrustation has been discovered upon the surface of the filtering material, due to lime and other chemicals present in the sewage, and therefore no difficulty is anticipated from this source.

7. The coloring matter in the sewage is of such a character that it is partly removed during its passage through the settling or septic tanks, and generally entirely removed by the time it has passed through the sprinkling filters. Occasionally the color may make its way through sprinkling filters,

but in all cases it is entirely removed by the time it has passed through the sand filter.

8. More or less odor must be expected in the vicinity of the plant, especially around the sprinklers. This odor will resemble that of tannery wastes, and will not be of a putrefactive and highly offensive nature. It is not anticipated that it will be objectionable to people riding on the railroads passing near the plant.

A comparison of the chemical composition of the crude sewage and effluents from the various tanks and filters may be made by means of the following table:

Quality of Effluents from Various Treatments. (parts per million).

	Organic Nitrogen.	Nitrogen as Freen Ammonia.	Oxygen Consumed.	Total Susp. Matter.	Nitrogen as Nitrites.	Nitrogen as Nitrates.
Crude Sewage	23	12	95	406	0.38	0.87
Settling Tank	13	13	57	81	0.32	0.55
Septic Tank	13	14	58	100	0.29	0 59
Sprinkling Filter No. 1	3.5	8	22	29	1.50	4.80
Sprinkling Filter No. 2	5	8.6	27	44	1.30	3.60
Sprinkling Filter No. 3	5.8	11	28	37	1.40	1.60
Sprinkling Filter No. 4	6 5	10	31	49	1.20	1.70
Settling Basin No. 1	3.2	8.3	22	21	1.45	4.30
Settling Basin No. 2	4.4	12	24	21	1.10	1.10
Sand Filter No. 1	0.96	4.4	11	00	1.50	6 40
Sand Filter No. 2	1.2	3.1	14	00	0.78	21.00

The gradual improvement in the character of the sewage as it passes from stage to stage in the process of purification, is very striking.

It is interesting to note the increase in the number of bacteria in the sewage during its passage through the septic tank and settling basin and the marked decrease in the number of bacteria in the effluents from the various sprinkling filters. It is important also to note the gradual increase in the number of bacteria in these effluents corresponding roughly with the decreased depth of filtering material. The number of bacteria in the effluents from the sprinkling filters increases considerably during the time in which it is passing through the secondary sedimentation process. The approximate numbers of bacteria in the crude sewage and various effluents are shown in the following table:

	Number per c. c.
Crude Sewage	1,600,000
Septic Tank effluent	5,000,000
Settling Tank effluent	2,000,000
Sprinkling Filter No. 1 effluent	300,000
Sprinkling Filter No. 2 effluent	390,000
Sprinkling Filter No. 3 effluent	680,000
Sprinkling Filter No. 4 effluent	900,000
Settling Basin No. 1 effluent	770,000
Settling Basin No. 2 effluent	1,000,000

The net result of passing the crude sewage through the septic tank, then applying it to sprinkling filters four feet in depth, then passing the effluent from the filters through a basin in which a large portion of the suspended matter was deposited, and finally applying the effluent from this settling basin upon sand filters, has been a purification amounting to a removal of 90% of the organic matter in the original sewage as measured by the organic nitrogen, which is shown, together with other analyses, in the following table:

	Parts per million.		
	Crude Sewage.	Effluent.	Percent.Removed.
Organic Nitrogen	23	0.96	96
Free Ammonia	12	4.4	63
Oxygen Consumed	95	11.	88
Suspended Matter.......	406	0.	100

No experiments have been made with different methods of disposing of the sludge, resulting from the preparatory treatment of the sewage and from the sedimentation of the effluent of the sprinkling filters. The city owns considerable land so located that the sludge can be run into lagoons built upon it, and it is probable that this will be the most satisfactory and economical method of disposing of it for some years to come. The sludge appears to be of such a nature that it can be successfully filter pressed, should that method finally become desirable.

It has been necessary from time to time to remove the sludge from the various tanks, in which case it has been discharged upon land in the vicinity and the method has not proved objectionable. While the sludge has some odor, resembling that of tannery wastes, it is not of a highly putrefactive nature or particularly offensive. The fresh sludge appeared to dry out more quickly and be more easily cared for than that which had been allowed to accumulate in the septic tank for a long period of time.

It is very desirable that the experimental plant be continued in operation throughout the remainder of the present summer. and if possible through another winter. The laboratory force has been greatly reduced, and consequently it will not be possible to continue the chemical work in as thorough a manner as has been the case in the past, but it is believed that much valuable information which will be of great assistance in the design and future operation of the proposed plant, will be gained in this way.

Recommendations:

After giving the entire problem most careful consideration, and in light of the various studies and experiments made, we make the following recommendations:

That sedimentation be adopted as a preparatory method of treating the sewage.

That the effluent from the sedimentation process be filtered through sprinkling filters either 7 feet or 5 feet in depth, at the rate of one million gallons per acre per day.

That the effluent from the sprinkling filters be passed through secondary sedimentation basins sufficient in capacity to reduce the quantity of suspended solids to thirty parts per million.

That if the filters are constructed five feet in depth the effluent from secondary sedimentation basins be filtered through sand filters at the rate of one million gallons per day.

The final decision as to depth of sprinkling filters will depend upon the estimated cost of first construction, as well as that of operation, and cannot be reached until further studies relating to design have been made. If reasonably economical, the filters five feet in depth followed by sedimentation and intermittent filtration through sand, will probably yield the most satisfactory effluent

GENERAL CONDITIONS.

The City of Gloversville is in the Town of Johnstown, County of Fulton, nine miles north of, and 500 feet above the Mohawk River at the Village of Fonda. It is the seat of the glove manufacturing industry in the U. S., and had a population of 18,349, according to the census report of 1900, and which at the present time is estimated to exceed 20,000.

Industries.

In addition to the glove manufacturing plants, there are twenty-six tanneries which dress glove and the finer grades of shoe leather. There is also one hair mill, one knitting mill, two silk mills and one brewery.

All of the domestic sewage, tannery refuse and mill wastes formerly emptied directly into Cayadutta Creek as it flowed through the city. The stream accordingly at times became highly colored and was the source of odors which caused some complaint.

The Cayadutta Creek.

Cayadutta Creek is a small mountain stream flowing in a southerly direction through the center of the city, and receiving three branches from the west. The watershed area of Cayadutta Creek at the sewage disposal works is 14 square miles. The measured dry weather flow September, 1908, was 2,700,000 gallons per day, equivalent to .298 second-feet per square mile. From the disposal works the creek flows three miles through the City of Johnstown, receiving the domestic sewage and wastes from about twenty-four tanneries of that city, and empties into the Mohawk river at Fonda, at which point the total watershed area of Cayadutta Creek and its tributaries is 61.04 square miles.

During a portion of 1898, the whole of 1899, and a part of 1900, measurements of the flow of the creek were taken for 24 consecutive months. The results of these measurements appear in the following table, together with the estimated normal flow of the creek, the measured flow of sewage (as observed in the 12 months July, 1908, to June, 1909, inclusive) and the ratio of dilution for each month:

Sewage Flow, Cayadutta Creek Flow and Ratio of Dilution.

Watershed of Creek, 14 Square Miles.

Month	Measured Flow of Creek Million Gallons per day.			Calcuated Av. Yield of Creek based on Normal Yield of Croton River for 32 years.	Measured Flow of Sewage.	Ratio of Sewage to Creek Flow. (Based on normal yield.)
	1898.	1899.	1900.	Million Gallons per day		
January	....	9.8	18.0	21.2	2.2 (1909)	1. 9.6
February	....	7.8	28.8	25.8	2.9	1. 8.9
March	....	18.5	15.5	30.6	3.0	1.10.2
April	....	62.7	35.0	24.2	3.8	1. 6.4
May	....	7.8	6.8	14.5	2.7	1. 5.4
June	....	6.3	5.3	7.1	2.3	1. 3.1
July	....	5.0	4.2	4.7	1.9 (1908)	1. 2.5
August	....	4.5	5.0	7.8	2.0	1. 3.9
September	....	5.0	4.5	6.7	1.9	1. 3.5
October	6.0	5.3	....	7.4	2.0	1. 3.7
November	22.7	6.3	....	14.0	1.8	1. 7.8
December	11.0	12.3	....	16.9	2.0	1. 8.5

Note: This table is made up of such measurements of the flow of Cayadutta Creek and Sewage as have been made, together with the average yield of the Creek calculated from the average yield of the Croton River for 32 years, 1868-1899 inclusive. (See report on New York Water Supply, by John R. Freeman, pp. 212, 240, 241.)

From these various measurements and estimates of flow it appears that there is available for dilution of sewage during dry weather, a quantity of creek water which may not greatly exceed, and which can seldom be more than three times the flow of the sewage. Such a condition is unusual and, as the dilution is very slight, it is essential that the sewage be very thoroughly purified before its discharge into the creek.

Litigation.

Litigation was commenced on August 17, 1899, by a farmer residing about four miles below the City of Johnstown, who filed a claim for damages and asked for an injunction restraining the City of Gloversville from emptying sewage into the Cayadutta Creek. The action was tried in October, 1900, and the plaintiff was awarded damages amounting to $19.50 per annum, and the city enjoined from discharging its sewage into the Cayadutta Creek and directed to remove its sewage from said creek within one year from January 29, 1901.

The case was appealed to the appellate division of the Supreme Court on behalf of the city, and finally to the Court of Appeals, which handed down a decision in May, 1903, confirming the decisions of the lower courts. Since that time numerous other cases have been brought against the city, and also

against mill owners, and twenty-three injunctions in all have been granted by the courts against the city. The time when these injunctions should take effect has been extended from year to year by the courts to permit the city to build a line of intercepting sewers, to remove the surface water from the sewer system, and for the purpose of experimental work on the purification of the sewage.

The damages awarded have been small, and the total cost of trying all the cases, over seventy in number, including damages and all expenses in connection with the trial of the cases and the postponement of injunctions, has been about $25,000.

Sewer System and Sewage.

The sewer system consists of 28.6 miles of separate sewers, 3.6 miles of combined sewers, and 3.25 miles of intercepting sewers.

At present considerable roof water enters the sewers. In 1903 there were 2,597 sewer connections; 388 roofs; 4,152 families, or 13,629 people connected and 15.696 people were tributary to the sewers, and the average number of people to one connection was 5.248; the average number of persons to each family 3.78; the ratio of roof water connections to the total connections, 1:6.7. The measured flow at that time was 100 gallons per capita of domestic sewage, including infiltration of ground water.

Water Supply.

The water supply of the city is obtained from springs and small streams outside of the watershed of the Cayadutta, in the foothills of the Adirondack Mountains, and is very pure and soft. The daily consumption is estimated to be about 2,250,000 gallons or 112½ gallons per capita.

Methods of Purification of Sewage.

Several methods are in use upon a large scale for the purification of domestic sewage, and in some places domestic sewage containing a considerable proportion of manufacturing wastes is successfully purified. The methods in use may be grouped into two classes:

1. Methods involving chemical and physical action.
2. Methods involving biological action or the action of bacteria.

Under the first classification may be included sedimentation, chemical precipitation and also, possibly, the septic treatment, although the latter has generally been considered as partly, if not essentially, a biological process.

By sedimentation is meant the process of passing sewage through settling basins and allowing the suspended matter to settle to the bottom of the the basins, thus permitting the drawing off of the clear water and separating a large portion of the suspended matter from the remaining impurities. This process may be carried out by the intermittent filling, resting and drawing off of suitable tanks, or by the continuous flow of the sewage through such tanks. The latter method is the one more frequently adopted and when a suitable equipment is provided and the process carefully managed will produce nearly as good an effluent as the intermittent plan.

When sewage is passed at a comparatively slow rate through sedimentation basins, the bacteria, under ordinary conditions, develop rapidly and produce certain chemical and physical changes in the suspended matter of the sewage, and also to some extent, at least, in the matters in solution. The bacterial action appears to be greatest in the sludge and perhaps the

most important biological feature of this process is the result of the action of bacteria upon the sludge.

In a few places all that has been found necessary for the treatment of the sewage has been to provide suitable means for sedimentation. In these cases the conditions are such that it is necessary to remove from the sewage only the floating and suspended matters. This is accomplished by the process known as sedimentation or by that known as septic tank treatment. Obviously with a dilution so slight as that which can be attained in Gloversville, neither of these methods will alone accomplish satisfactory results.

In many cities where neither sedimentation nor the septic process is sufficient, certain chemicals have been added to the sewage, thus increasing the rapidity and completeness with which the floating and suspended matters are precipitated or allowed to settle to the bottom of the basin through which the sewage is made to flow. By this process in some places a small amount of the impurities in solution is also removed from the sewage.

While each of the foregoing processes may be suitable for adoption under certain extremely favorable conditions, they cannot be seriously considered for the city of Gloversville except as preliminary to a more complete purification. The studies which have been made upon them have therefore been planned with a view to determining their efficiency as preliminary methods to be used in conjunction with other processes.

Several processes of the second classification involving bacteriological action are in common used for the purification of sewage. Two of these have been seriously considered in connection with the local problem, namely, intermittent filtration through sand, and the process commonly called in this country, purification by sprinkling filters.

Intermittent filtration through sand has been used in this country, as well as abroad, with marked success for nearly twenty years. It has been adopted by many cities in Massachusetts where there are large natural deposits of sand of a character suitable for this work. Under this method of treatment the sewage, either with or without preliminary treatment, is turned upon the surface of beds composed of coarse sand. These beds are usually about 4½ feet in depth, and are provided with a system of underdrainage by which the sewage, after passing through the sand, is collected and conveyed away from the filters and discharged into a convenient stream. The purifying efficiency of these beds is dependent largely upon the life processes of bacteria, and the conditions under which the filters are operated must be favorable to the growth and life of these organisms or the results will not be satisfactory.

The quantity of sewage which can be filtered upon a given area of intermittent filters varies according to its strength, the size of the grains of sand, the temperature, ground water conditions, and particularly the care given the beds. In general it may be stated, however, that one acre of filter will purify from 50,000 to 100,000 gallons of sewage per day. In some cases, however, it has been found to reach a quantity even as high as 150,000 gallons per acre per day, and in other exceptional cases, a rate of 50,000 gallons has been maintained only with difficulty and moderate efficiency.

The sprinkling filter, like the intermittent filter, depends upon the life processes or organisms to accomplish its work. Instead of being composed of fine grains of sand, it is formed of coarser particles, and clinkers, wastes

from coal products, coke or crushed stone may be used. The depth of such beds varies from 4 to 10 feet. The sewage is applied by an apparatus which will distribute it in comparatively fine drops much as water falls upon the earth in time iof rain. By this method of application, the rate at which the sewage is applied, being properly regulated, the sewage is allowed to trickle over the stones in the filter, coming in contact with the large numbers of organisms which adhere to the surfaces of the stones and which derive their nourishment from the sewage. These bacteria assimilate the organic substances, which under ordinary conditions, would undergo putrefaction, and transform them into substances which under similar conditions will not undergo putrefaction. Such filters are provided with elaborate under-drainage systems, so that the putrified sewage may be taken away as fast as it trickles through the filtering medium.

Reasons for Further Investigation and for Establishing an Experiment Station.

While the treatment of domestic sewage has been studied at many places for a long time, it is nevertheless considered desirable in many cases to establish experiment stations for the purpose of studying different methods of treating sewage under local conditions. Exception may possibly be taken by some to this view, on the ground that there are in existence in this country and abroad, a large number of plants in actual operation for the treatment of domestic sewage, and that many of these plants are highly satisfactory and successful. This argument, however, cannot be fairly advanced in the case of Gloversville, because there are very few cities which have a sewage comparable with that of this city, and there is probably no city successfully purifying sewage of a similar quality, on a large scale. Sufficient data was not available to serve as a safe guide in the solution of the local problem, and it was believed that further special study of this particular sewage was needed before the method of treament could be selected and the disposal works designed.

When the problem of sewage disposal was first presented, the sewage from the city was discharged into the Cayadutta from a comparatively large number of independent sewers, and refuse wastes flowed from each tannery directly into the creek. After a careful consideration of the feasibility of taking a large number of samples from each sewer and tannery outlet pipe, combining them in proportion to the several quantities discharged daily, and making experiments with the composite samples thus obtained, it was decided that such a method of investigation would not give satisfactory and reliable results. It was further decided that such studies could not be profitably made until the intercepting sewer had been built and the lateral sewers connected therewith, and the tanneries had been provided with settling tanks and connections therefrom had been made with the trunk sewer. In other words, it was not wise to proceed with such experiments until the sewage of the city could be delivered at the site of the disposal works in a condition fairly comparable with that in which it would be received after the disposal plant was completed and in full operation.

A review of the conditions found to exist led to doubt upon a number of points of vital importance to the success of the proposed plant for the purification of the sewage. These points may be grouped into eight different questions, which will be briefly presented as representing the most important

objects of the sudles to be carried out at or in connection with the experiment station which was built by the city.

1. Is the sewage of such a character as to be purified by the usual biological processes, and what would be the effect of the chemicals upon such processes?

2. What will be the effect of the extreme cold of the winter upon the processes available for purification, and will it be necessary to cover tanks and filters to protect them from the cold weather?

3. Taking into consideration the chemicals in the sewage, its strength, and the low temperature during the winter months, at what rate can the sewage be purified on a given unit size of filter, and what will be the size of the plant required under these conditions?

4. To what extent can the suspended matters in the waste liquors from the mills be retained in mill tanks and what quantity of suspended solids will the sewage contain after such tanks are built and put into operation?

While it might be possible, though very difficult, to determine the amount of suspended matters escaping from the mill tanks with the effluents, it was not practicable to determine the amount of precipitation which might take place in the trunk sewer. It is quite probable that chemicals might leave these tanks, dissolved in the respective effluents, and yet be precipitated by chemicals similarly discharged in solution from other tanks, thus forming suspended matter within the trunk sewer. It is therefore apparent that the only practical method of determining the amount of suspended matter is by analyses of the daily flow of sewage from the main intercepting sewer.

5. What will be the quantity of sludge produced by the different processes of purification with reference to methods of disposal and to the tank capacity to be provided for the storage of sludge at different seasons of the year, particularly in the winter when some difficulty may be experienced in disposing of the sludge upon land?

6. What would be the effect upon the physical condition of the filters, of the chemicals carried through the tanks provided for preliminary treatment?

7. Is the coloring matter in the sewage of such a character as to permit of its removal by filtration?

8. Will odors arise from the plant in such quantity and of such character as to be seriously objectionable to people traveling on the railroads in the vicinity?

For the purpose of investigating the foregoing subjects and many others of a subsidiary nature, a laboratory was built and equipped and a small experiment station was provided containing various tanks and filters with which the several processes, any of which might later be adopted on a large scale, could be tried.

EXPERIMENT STATION.

Laboratory.

A one-story building with basement was erected to contain the chemical and bacterial laboratories. The dimensions of the building and of the various laboratories are as follows:

Main building, inside dimensions,	24 ft. x 24 ft.
Chemical laboratory,	12 ft. x 24 ft.
Bacteriological laboratory,	7 ft. x 8 ft.
Preparation room,	12 ft. x 12 ft.
Weighing room and office,	7 ft. x 10 ft.

Power Plant.

The sewage is delivered to the station by the main intercepting sewer which is at an elevation several feet below that of the tanks of the experiment station.

The city is fortunate in owning as a part of this sewage disposal property. a small water power privilege. This privilege was utilized for the purpose of pumping sewage to the experimental tanks. A 12-inch Morgan Smith turbine was set under a head of 9.06 feet, and made 258 revolutions using 200 cubic feet of water per minute. The water of the creek was delivered to this wheel by means of an old penstock, a new tailrace being excavated to the stream.

Belted to the turbine was a 2½-inch Gould, vertical, submerged, centrifugal pump, pumping against about 20 feet head, making 516 revolutions per minute, delivering about 125,000 gallons at first and later 155,000 gallons of sewage per day through 36½ feet of 3-inch pipe.

Screen.

The pump was protected and entirely surrounded by a screen composed of ¾-inch wooden bars, set vertically 1⅛ inches apart. This screen was set in the center of a chamber somewhat wider than and on the line of the sewer so that only the portion of the sewage going through the pump was screened, the balance passing around on either side.

Grit Chamber.

The sewage was delivered to a grit chamber 8 ft. x 5 ft. x 5 ft. deep. This chamber was provided with an overflow, and at one end with three orifice chambers, so that the sewage was discharged from the grit chamber through the orifices into small chambers from which it flowed to the several tanks.

As described elsewhere in this report, the grit chamber as originally constructed was not successful, and it was subsequently reduced in size to a chamber 6 ft. long and 22 inches deep, with a width varying from 10 inches at the inlet end to 3 feet at the orifice end.

Septic Tank.

A wooden tank was provided for experiments upon the septic process. This tank was 32 ft. long and 8 ft. wide, with 8.2 ft. depth of sewage and a capacity of 15,702 gallons. Three baffles or dams for halding back the sludge were placed across the tank. These were 8 ft. apart, thus dividing the tank into four compartments; in the beginning the first dam was 2 ft., the second 1½ ft., and the third 1 ft. high. Early in December the dams were raised to a height of 4½ ft., 4⅔ ft., and 2⅓ ft., respectively. There were also three scum boards extending to a depth of 2 ft. at first and later 4 ft. below the surface of the sewage and placed across the tank. These were spaced, starting at the inlet end, 9 ft., 8 ft., 8 ft., and 7 ft., respectively. When the alterations were made in December, the third scum board was removed.

The inlet pipe discharged into a box extending across the inlet end of the tank. This box was 12 inches wide and 6 inches deep, with hole in the bottom, and was for the purpose of effecting a uniform distribution of the sewage at the inlet end of the tank.

The effluent from the tank was skimmed from the surface by means of a wooden box placed across the end of the tank. This box was 8 ft. long, 2 ft. wide, and 3 ft. deep. The water before flowing into the box passed under a scum board set at an angle of about 45 degrees with the vertical and extending down to a depth equal to that of the bottom of the box. This board sloped away from the box in such a manner that sludge brought up into the upper strata of water by gas at a point near the box, would be carried away from instead of being attracted towards the box.

A large amount of suspended matter was carried out of this tank with the effluent during the season of fermentation in 1908, and accordingly the tank was remodeled and provided with a series of chambers near the outlet end, the purpose of which was to allow of frequent removal of the suspended matter collected in them, thus preventing its being discharged with the effluent.

Settling Tank.

The construction of the settling tank was like that of the septic tank in every respect. It was 32 feet long, 8 feet wide and held a depth of 8 feet of sewage. The capacity was 15,319 gallons.

Sprinkling Filters.

Four sprinkling filters were constructed in cylindrical wooden tanks. They consisted of limestone broken ino sizes varying from 1½ inches to 2 inches in diameter. Each tank had a false bottom covered with field stones about 6 inches in diameter to facilitate drainage and aeration. There were also about six ventilating pipes passing through the sides of each filter just above the false bottom. Each filter was .003 of an acre in area. The sewage was applied by means of one fixed Columbus nozzle in the center of each filter, in a continuous stream under a constant head of 5 ft. The filters were numbered 1, 2, 3, and 4, and were 10 feet, 7 feet, 5 feet and 5 feet in depth, respectively.

In considering the range of materials available for this type of filter, due regard was had for the large amount of light, finely divided suspended matter, which is at all times present in the sewage. It was felt that conditions were likely to arise under which considerable of this matter might pass out of the tanks and on to the filters. There is also a probability that there will be more or less incrustation of salts of lime upon the particles of filtering medium. For these reasons it was deemed wise to use only a coarse-grained medium, and the size was fixed with a view to providing as liberally as possible for flushing any accumulation of suspended matter from the pores of the filter, and at the same time to furnishing a large area of contract and thus avoiding an excessive depth of filter. Having thus determined upon the size of stone to be used, the problem remaining was to determine the optimun depth of filter and the proper rate of filtration through a filter of that depth. By thus narrowing this part of the problem down to these two points, the experimental equipment required and the routine work at the station were greatly reduced and simplified.

Settling Basins.

Two settling basins were provided to receive the effluent from the sprinkling filters. Basin No. 1 received the effluent from filters Nos. 1 and 2 and basin No. 2 received the effluent from filters 3 and 4.

Settling basin No. 1 consisted of a wooden tank divided into three sections, the water passing through the entire length of each section consecutively, thus virtually making three separate tanks, each one being 5 feet 7 inches long by 2 feet wide by 2 feet deep.

Settling basin No. 2 consisted of a wooden tank divided into six sections each being separate from the others, and of the following dimensions, length 7 feet 7 inches, width 16 inches, depth of water 4 feet. The water passed through all of the sections consecutively.

Intermittent Filters.

Two intermittent sand filters were provided, numbered 5 and 6, respectively. The sand used for these filters was very coarse and remarkably uniform, giving the following results upon mechanical analysis:

TABLE I.

Mechanical Analysis of Sand.

Size of Sieve		Amount Passing	
No. of Sieve	M M.	Grams.	Per Cent.
200	0.091	1.5	0.7
140	0.130	2.7	1.3
100	0.206	5.6	2 6
80	0.247	10.4	4.8
60	0.357	19.0	8.8
40	0.486	36.5	17.0
35	0.55	56.0	26.1
30	0.65	86.5	40.3
25	0.93	147.6	68.6
20	1.04	176.0	81.9
16	1.41	205.0	95.4
0.103"	2.40	214.2	99.7
0.156	3.8	215.0	100.0
	Total	215.0	100.0
	Loss	0.0	0.0
	Amount Sieved	215.0	100.0

60% finer than 0.847 MM

10% finer than 0.376 MM (effective size)

Uniformity Coefficient, 2.253.

Filter No. 5 was 4 ft. in depth and .001 of an acre in area. It was underdrained with half tile covered with graded layers of field stones.

Filter No. 6 was 5 ft. in depth, .000091 acre in area.

Filter House.

In the latter part of November a frame building was erected to cover the tanks and all the filters, with the exception of sprinkling filter No. 4 which was left unprotected except that an embankment of earth was thrown up about the filter tank, although not exceeding it in height. It is possible that

this filter benefitted also from the fact that it was located very close to the southerly end of the filter house, which naturally sheltered it to some extent, although the wind blows from the north only on very infrequent occasions, due doubtless to the topographical conditions of the surrounding country. The prevailing winds are from the west, although easterly winds occur at frequent intervals.

The frame of the building was covered with a single thickness of square edged boards 1½ inches in thickness. (This material was selected because it could subsequently be used for the construction of sidewalks). The roof and sides of the building were covered with tarred paper. The roof of the building was removed about the first of April.

Organization.

The investigations have been carried on under the general direction of the City Engineer, by one Chemist and several assistants, as follows:

Chemist, Harry B. Hommon.
Asst. Chemist, Lee A. Chase, until Dec. 24, 1908.
Asst. Chemist, George Orr.
Day Inspector, Herbert Kniskern.
Night Inspeitor, Charles Clark.

Temperature of Air and Sewage.

In Appendix A will be found table of maximum and minimum temperatures for December, January, February and March of each year from 1898-1908 inclusive. These data have been furnished through the courtesy of John McLean, V. M. O.

From the records of daily observations of minimum temperatures, Table II has been compiled showing the number of days in each winter period of four months when the minimum temperature fell below certain specified temperatures.

TABLE II.

Number of Days in December, January, February and March of Each Year when the Minimum Temperature of the Air was Below that Specified.

Year.	Degrees Fahrenheit.										
	20	10	5	0	−5	−8	−10	−15	−18	−20	−25
1898	66	30	20	16	9	6	5	2	1	1	....
1899	72	46	32	22	13	8	6	3	2	–	....
1900	87	44	28	15	8	3	2	–	–	–	....
1901	84	52	39	23	6	5	3	1	–	–	....
1902	74	44	31	17	6	5	3	1	1	...	....
1903	66	31	23	13	8	5	4	1	–	–	....
1904	93	61	45	33	23	12	11	5	4	3	2
1905	79	48	36	27	11	7	5	2	1	...	–
1906	77	45	25	19	14	9	5	1	1	1	–
1907	71	39	25	20	11	11	9	4	2	1	–
1908	79	45	33	20	12	7	6	3	1	1	1
1909	58	23	16	7	4	2	2	1	...	...	....
	75.5	42.3	29.4	19.3	10.5	6.6	5.0	2.0	1.0	0.6	0.25

From the foregoing tabulation it appears that in 1904 the temperature fell to 0 or below on 33 days and that a minimum temperature of 0 was reached on about 20 days each year throughout the period of years covered by these observations. It is also evident that a minimum temperature of 20° should be expected upon about 76 days during the winter season of each year.

During the period covered by the work at the experiment station, daily observations have been made of the temperature of the air at the station which appear in detail in Appendix B. The results of some of these observations have been summarized and classified according to the number of days on which certain minimum and maximum temperatures have been reached. The results of this classification appear in Table III.

TABLE III.

Number of Days in Month when the Temperatures were Below those Specified.

Degrees Fahrenheit.

	Minimum								Maximum						
Month	32°	25°	20°	10°	0°	-5°	-10°	-20°	-5°	0°	10°	20°	32°	35°	40°
Dec. 07	22	10	7	1	1	0	0	..	0	0	0	0	9	18	23
Jan. 08	21	21	20	13	6	4	2	2	1	1	1	1	8	15	18
Feb. 08	28	27	27	25	16	13	7	1	0	1	1	5	17	18	25
Mar. 08	28	22	11	7	2	0	0	0	0	0	0	0	5	7	12
Dec. 08	30	27	21	11	5	4	1	0	0	0	0	1	15	21	26
Jan. 09	29	23	20	17	9	7	3	1	0	0	1	4	12	17	26
Feb. 09	26	24	22	8	4	4	3	0	0	0	0	2	11	15	21
Mar. 09	31	27	20	8	1	0	0	0	0	0	0	0	4	9	16

The extent of the cold weather is well illustrated by the statistics for February, 1908. During this month the minimum temperature was below 32° on 28 out of 29 days, and the maximum temperature was below 32° on 17 days. During the four winter months beginning December, 1908, and ending March, 1909, the minimum temperature was below 32° Fahr. on 116 out of a total of 121 days. By referring to Table II, it will be observed that the winter of 1908-9 was materially warmer than that of several winters included in this compilation of temperature.

Temperatures in Filter House.

The housing of the tanks and filters had a marked effect upon the temperature of the air surrounding them. The temperatures of the air within the building are given in Appendix C. The uniformity of the temperature at different times of the day from day to day is very noticeable. While provision was made for artificially heating the building, such heat was applied only on two or three occasions and had no effect whatever upon the general temperatures as recorded. It is important to note that on only two occasions did the mercury fall as low as 32 degrees, and only on one day did it reach a lower temperature.

The temperatures, Table IV, of the air within and without the building at six o'clock in the morning for the month of January, 1909, will serve to show the effect of the house upon the temperature of the air surrounding the filters:

TABLE IV.

Temperature of Air at 6 o'clock A. M. Within and Without Filter House.

(Degree Fahrenheit).

Days of Month.	Outside Air.	Inside Air.
1	12°	38°
3	15	36
4	31	38
5	34	40
6	36	42
7	−2	36
8	−6	30
9	10	32
10	27	36
11	32	38
12	16	36
13	−2	36
14	10	36
15	30	38
16	−8	36
17	12	35
18	12	36
19	−20	34
20	24	38
21	14	37
22	26	39
23	28	40
24	34	42
25	30	40
26	22	39
27	14	36
28	14	38
29	0	34
30	18	37
31	12	37

Temperature of Crude Sewage.

The temperature of the sewage at Gloversville is somewhat lower than that of many other cities. This is due doubtless partly to the lower temperature of the air, and also to the discharge into the sewer of large quantities of tannery wastes, which are universally cold, the water used in the tanning processes being taken either from the city supply, driven wells or the Cayadutta Creek, comparatively little of which is heated.

By way of comparison the average temperatures of the sewage from Gloversville and Waterbury, Connecticut, are presented in Table V.

TABLE V.

Monthly Averages of Temperatures of Crude Sewage at Gloversville, N. Y., and Waterbury, Conn., Experiment Station.

(Degrees Fahrenheit)

Month	Gloversville	Waterbury	Difference
January	47	50	3
February	46	50	4
March	45	49	4
April	46	52	6
May	51	60	9
June	57	61	4
July	59	65	6
August	63	72	9
September	61	73	12
October	57	66	9
November	52	52	0
December	49	50	-1

From this table it appears that the temperature of the sewage at Gloversville was lower than that at Waterbury, during each month except November, with a maximum difference of 12° in September. It is also interesting and important to note that the greatest differences in temperatures occurred during the warmer months, which doubtless has a marked bearing upon the absence of the usual activity of fermentation in the septic tank.

PRECIPITATION.

Rainfall.

Statistics regarding the monthly rainfall for each year from 1898 to 1909, inclusive, have been furnished through the courtesy of Jno. McLean, V. M. O., and appear in Table VI. It will be noticed from this tabulation that the precipitation during 1908 was considerably less than the normal and that it was unusually high in January, February and April of 1909, which fact doubtless had an important influence on the high flow of sewage during the spring of 1909.

TABLE VI.

Precipitation at Gloversville, N. Y.

(Inches)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1898	6.90	3.33	3.02	4.32	6.45	5.14	4.73	6.90	3.10	5.52	4.64	3.08	57.19
1899	2.32	2.22	7.36	1.38	3.23	3.46	4.09	1.66	3.28	2.15	2.18	3.31	36.64
1900	3.95	3.88	4.80	1.63	1.72	1.92	2.14	3.23	2.22	2.87	5.20	2.12	35.74
1901	2.37	1.09	2.78	3.72	3.57	3.70	3.49	4.19	3.86	1.08	2.23	3.88	36.02
1902	1.85	3.13	3.24	3.74	2.14	5.48	7.04	2.09	4.37	4.22	1.62	7.01	45.93
1903	3.92	3.90	7.32	1.37	.16	9.42	4.06	6.78	.64	5.75	2.54	3 28	49.14
1904	4.33	3.97	3.72	4.28	2.37	5.36	3.09	4.67	4.52	3.40	.38	3.80	43.89
1905	4.87	2.31	2.90	3.01	2.38	6.17	5.21	4.68	6.43	3.00	3.84	4.63	49.43
1906	2.90	3.01	4.57	3.25	5.31	4.32	4.06	2.89	3.56	3.06	3.04	5.70	45.67
1907	3.75	1.44	3.52	3.98	3.26	1.66	3.14	1.41	6.68	4.67	4.10	4.58	42.19
1908	2.62	4.56	3.78	3.09	5.67	1.37	2.56	2.73	1.61	3.27	1.32	4.35	36.93
1909	5.33	6.86	2.50	4.19	4.51	3.99							
								Av. Total—43.53					

Snowfall.

On account of the low temperatures of this region, the quantity of precipitation in the form of snow is very large, as indicated by Table VII.

TABLE VII.

Snowfall at Gloversville, N. Y.

(Inches of Snow)

Year	Snow	Year	Snow	Year	Snow
1892	76.57	1899	91.5	1906	110.3
1893	103.3	1900	80.5	1907	72.0
1894	90.6	1901	66.3	1908	106.0
1895	63.2	1902	115.4		
1896	85.5	1903	69.1		
1897	86.2	1904	108.0		
1898	83.9	1905	86.0		

Average for 17 years 88.0 inches.

RELATION OF INDUSTRIES TO PROBLEM OF SEWAGE DISPOSAL.

Quantity of Mill Wastes.

Gloversville has two important industries, the manufacturing of gloves, in which a large proportion of the population is engaged, and the tanning of skins for fine leathers, much of which is used for the manufacture of gloves. There are no mill wastes from the factories manufacturing gloves, but there are large quantities of wastes from the tanneries. The influence of the tanneries upon the quantity of sewage may be seen from Table VIII giving the approximate normal flow in gallons per day from each tannery, as well as the flow from a hair mill, a knitting mill and a silk mill. The quantities given in the table are based upon the most reliable information obtainable, but the actual amounts undoubtedly vary from time to time above and below the figures given, according to business conditions, seasonal variations and changes in methods.

TABLE VIII.

Quantities of Wastes Discharged by the Several Manufactories.

1.	Bartlett, Charles & Son..	7,000	gals. per day
2.	Jullus Bleyl	10,000	"
3.	Bradt, Harry	5,000	"
4.	De Lamater		(not running in 1908)
5.	Filmer Brothers	17,000	"
6.	D. Filmer	18,000	"
7.	Fear & White...........	2,000	"
8.	O. Geisler Leather Co....	75,000	"
9.	Hall & Johns...........	25,000	"
10.	Daniel Hays Co..........	15,000	"
11.	Holland		(not connected in 1908)
12.	Leak Fur Co.............	27,000	"
13.	Lehenbeim & Sons......	80,000	" (burned 1908)
14.	Levor & New...........	30,000	"
15.	Mills Brothers	30,000	"
16.	E. S. Parkhurst & Co...	280,000	" (not connected with experim't stat'n)
17.	Phoenix Leather Co.....	15,000	"
18.	Robinson Brothers	65,000	"
19.	Rogers & Smith........	3,000	"
20.	S. H. Shotwell & Son....	30,000	"
21.	E. W. Starr............	25,000	" (not connected with experim't stat n)
22.	Surpass Leather Co.....	72,000	"
23.	Steele Brothers	24,000	"
24.	J. Stockamore	15,000	"
25.	Geo. F. Troutwine......	20,000	"
26.	Troutwine & Co.........	20,000	"
27.	Wood & Hyde..........	20,000	"
28.	Gloversville Knitting Co.	20,000	"
29.	Gloversville Silk Mills...	6,000	"
	Total	956,000	gals. per day

Relative Quantities of Domestic Sewage and Mill Wastes.

From Table VIII it appears that the total amount of manufacturing wastes which have hitherto been discharged directly into Cayadutta Creek was in excess of 950,000 gallons per day. The flow of domestic sewage being practically 1,500,000 gallons per day, the combined daily flow of sewage and manufacturing wastes is, therefore, about 2,500,000 gallons, which represents approximately the amount of sewage to be purified, although a few of the mills are not yet connected with the trunk sewer. In other words, the manufacturing wastes amount to 38 per cent. of the total flow, and are equivalent to 63 per cent. of the domestic flow. It should be borne in mind that almost the entire amount of manufacturing wastes is discharged during the 10-hour working day, and the hourly rate of flow during that period is very materially increased thereby. This subject will be treated more fully under the consideration of the flow of sewage received at the disposal plant.

General Method of Tanning.

The manufacture of fine leather requires the use of very large quantities of a great variety of tan barks, tan extracts, chemicals, dye-stuffs and other materials.

The gross weight of wet and dry hides tanned in Gloversville annually amounts to about 9,000,000 pounds, and about 8,000,000 pounds of chemical reagents and other substances are used in the process.

The general procedure employed in tanning is as follows: first, the hides are soaked and softened. This treatment removes any soluble chemicals in which the hides may have been cured, and also some organic matter, both soluble and insoluble. After softening, the hides are depilated by treatment in lime vats, or in some other manner. When lime is used, as is quite generally the case, large quantities of it are carried off in suspension, as well as in solution, with the waste liquors from the process. When other chemicals are used they too are to a considerable extent discharged, some in solution and some in suspension, with these waste liquors. In addition, a part of the lime which is at first taken up by and adheres to the skins is removed from them by the subsequent bateing and drenching process, and together with considerable organic matter is discharged with the waste liquors from this treatment.

The next stage in the process is the tanning. For this, many different materials are used, although all are somewhat similar in nature. These materials are used in solution, or at least their soluble portions are the effective agents. Obviously, the waste liquors from this part of the process contain more or less of the active reagents, as it is no possible to completely exhaust the solutions, and in cases where only a part of the material added to the fresh bath is soluble, the balance of insoluble matter is also largely wasted.

Chemicals Used at the Tanneries.

The tanning of shoe leather usually involves the use of but comparatively few chemicals, but the preparation of glove leather is a much more delicate process and the variety of reagents used is much greater.

Every tanner naturally has his own views of the particular process which gives the best results, and this together with the variety of skins worked and of tanned products produced, accounts for the great number of materials used in the tanning process.

The list given in Table IX, though not absolutely complete, will give some conception of the kinds and amounts of chemicals and other reagents employed:

TABLE IX.

List and Approximate Quantities of Chemicals Used in Tanneries.

Name.	Pounds per Year.
Alderwood	51,219 lbs.
Alum	348,986 "
Anilines	7,263 "
Arsenic	70,750 "
Bichromate of Potash	48,250 "
Blue Stone	1,486 "
Copperas	15,590 "
Egg Yolk	319,802 "
Fish Oils	106,805 "
Flour	396,808 "
Fustic	321,469 "
Gambler	675,153 "
Hypernic	111,680 "
Hyposulphite of Soda	194,980 "
Lactic Acid	108,250 "
Lime	2,249,708 "
Logwood	160,102 "
Manures	441,700 "
Muriatic Acid	113,460 "
Sulphuric Acid	61,161 "
Pumice Stone	114,545 "
Quebracho	39,112 "
Quercitron	33,712 "
Sal-Soda	152,263 "
Salt	1,853,930 "
Soda-Ash	55,825 "
Sulphite of Sodium	45,324 "
	8,099,333 lbs.

The shrinkage in weight of hides during the process of tanning probably amounts to not less than 50% or 4,500,000 pounds per year, assuming 9,000,000 pounds as the gross weight of hides received at the tanneries. It is also probably true that 50% of the chemicals and other agents employed in the process of tanning are carried away from the tanneries in the form of refuse. The only process which is employed to recover any portion of these wastes, is that carried on at the hair mill for the recovery of the hair. The weight of the wet refuse taken from the tanneries to the hair mill per annum is nearly 6,300,000 pounds, or 70% of the total gross weight of hides. A large proportion of the hair contained in this refuse is recovered. There is also a very large amount of refuse matter containing much lime which is wasted from the hair mill.

Analyses of the creek water indicate that the amount of wastes which find their way from the tanneries to the creek averages over 30,000 pounds per day, or 9,000,000 pounds per year. It would, therefore, appear that of the 17,000,000 pounds of hides and chemicals used, fully one-half eventually found it way into the creek before the mill tanks were installed. This is undoubtedly a low estimate of the total amount of wastes, for the reason that considerable portions are of such a nature that they do not flow along with the water, and would not be included in the samples. At nearly every tan-

nery are to be seen large quantities of lime and other refuse, which have been dumped out upon the land and, of course, not included in the analyses already cited.

Condition of Mill Wastes.

From the foregoing discussion of the industries which contribute mill wastes to the sewage of the city and the processes of tanning which are in use, it appears that the waste liquors from the mills are heavily charged with organic and inorganic impurities both in suspension and in solution. These impurities consist in part of large quantities of the chemicals used in tanning, and their effect upon some of the processes of purification of sewage which might be adopted was one of the subjects to be carefully considered before finally determining upon the kind of a plant to be installed. The proportion of mill wastes to the domestic sewage is sufficient to make them at times the dominating element in the character of the sewage.

MILL SETTLING TANKS.

A mere inspection of the wastes from the tanneries shows that large quantities of solid refuse must be disposed of and that the liquid wastes are heavily laden with organic and inorganic matters. Much of this can be settled out in suitable sedimentation basins constructed at the several tanneries. This is a very necessary feature of the system of sewage disposal for two reasons:

1. Because such great quantities of solid matter would undoubtedly form accumulations in the intercepting sewer and branches leading thereto, from which it could be removed only at large expense. To undertake to convey this solid material through the intercepting sewer and laterals to the purification works would be very unwise.

2. Because this matter would seriously complicate operations at the disposal works.

Of the suspended matters in the liquid wastes discharged from the tanneries, there will inevitably be a small portion which will pass through the mill settling tanks and enter the sewers. This should be confined to materials comparatively finely divided and light in weight, so that they can be readily carried along by the sewage.

Ordinance Regulating Mill Tanks.

After much investigation and study of the proper course to be followed, and having due regard for the rights of the mill owners, the obligations of the City and the interests of all the citizens, the following ordinance was passed by the City Council:

CHAPTER 4. LAWS OF 1908.

> The Common Council of the City of Gloversville, in regular session assembled, does hereby enact the following ordinance for the purpose of regulating and controlling the use of the sewer system of the City of Gloversville by mills, faitories and other manufacturing establishments.
>
> Section 1. No refuse, mill waste, sewage or other impure or offensive matter from any mill, factory, manufacturing establishment or other properties, shall be allowed to enter any stream within the limits of the City of Gloversville.

Section 2. No mill, factory or other manufacturing establishment, having mill waste shall use the sewer system of the City of Gloversville for sewering purposes without first connecting said mill, factory or other manufacturing establishment with settling tanks.

PURPOSE OF TANKS.

Section 3. The purpose of the tanks at the mills is to remove the suspended solids, hair, leather and other heavy material from the mill wastes by sedimentation and any chemical or biological action that may take place in the tanks, so that the combined mill and domestic sewage may be purified, also to avoid the clogging of city sewers or unnecessarily burdening the sewage disposal plant.

SIZE.

Section 4. The size of the tanks to be constructed, or used at any mill that is connected with the sewer system of the City of Gloversville shall be sufficient for the purpose for which they are intended, and they shall be constructed with such features and of such dimensions as may be required by the Common Council.

CHANGES.

Section 5. If because of local conditions it is impossible to follow the plans and dimensions as given, any necessary changes must be made subject to the approval of the City Engineer, and then only on submission to the City Engineer of the plans showing just what changes are to be made, and how it is desired to construct the tank. Should existing tanks not operate or give results satisfactory to the Common Council they shall be changed, enlarged or rebuilt according to the direction of the Common Council by the mill owner within one month after written notice to that effect.

CONNECTIONS WITH SEWER SYSTEM.

Section 6. No connection with said sewer system shall be made by any mill, factory or other establishment desiring to sewer wastes without first filing a written application therefor and obtaining the consent of the Common Council.

Connections of tanks to the trunk sewer are to be made at manholes only, which are to be constructed by the city at the expensé of the mill owners

TANKS WATER-TIGHT.

Section 7. The tanks must be water-tight, so that no ground, spring or surface water will enter the sewer from the tanks.

CINDERS.

Section 8. Whenever required, screened cinders are to be used between the weir and the outlet of the tanks.

OPERATION.

Section 9. Both sections of the tanks must be used at the same time except when cleaning one section, the other may be used separately. No tank shall be allowed to fill more than one-third of its depth with settled

solids. There shall be no holes or leaks in the outlet end of the tank so that the liquid wastes may escape in any other way except by overflowing the top of the outlet end, unless tanks are of special construction, and unless permitted by special written permit from the City Engineer.

CLEANING TANKS.

Section 10. Tanks must be regularly cleaned at such intervals as their operation proves necessary or at any time when the City Engineer deems they should be cleaned. In cleaning the tanks no solids shall be emptied into the sewer or outlet from the tanks, nor in any other way shall solids from the tanks be permitted to enter the sewer in cleaning.

If the tanks are not properly cared for or if they are not cleaned when necessary or when directed by the City Engineer, they will be cleaned by the City and the expense thereof charged to the owner of the mill.

ACESS TO TANKS.

Section 11. Free access to the tanks must be given to the Common Council or their representatives at any times for either the purpose of measurement, analyses, experiments or inspection or for any other purpose connected with the operation or regulation of said sewer system.

CHANGES OR ADDITIONAL REQUIREMENTS.

Section 12. Any regulations or requirements hereafter adopted by the Common Council, or any changes in the size or form of construction, or operation of the tanks that may hereafter be directed by the Common Council, must be complied with.

The Common Council shall have the right to discontinue connections with the sewer system at any time, without notice to the mill owner, if the requirements and regulations for the use of said sewer system, or the directions of the City Engineer are not complied with.

INJURIOUS MATTER.

Section 13. Any matter from the mills that may be detrimental to the purification of the sewage of the city of Gloversville, or interfere with the operation of the disposal plant, shall be removed by such mill owner from the sewer on order of the Common Council or City Engineer, and it shall not be again permitted to enter the sewer.

NATURE OF CONSTRUCTION.

Section 14. The tanks shall be constructed of such material and in such manner as to meet the approval of the City Engineer.

REPAIRS.

Section 15. The tanks shall be kept at all times in good condition of repair.

REPORTS.

Section 16. The proprietor of each mill shall, on or before January 15th of each year, and as much oftener as shall be required by the Common Council, make a report in writing to the Common Council, stating the amount of water used, amount of leather dressed, number of men employed, and the amount of chemicals used during such period as the Common Council shall fix. Such proprietor shall also furnish the Com-

mon Council with such additional information as it may deem necessary for the care and operation of the sewer system and disposal plant, providing such information will not injuriously effect his business.

PENALTY.

Section 17. Any person violating the provisions of this by-law shall be subject to a penalty of $25.00 for each offence and a further sum of $5.00 per day for each and every day such violations shall be continued. Section 18. This act shall take effect immediately upon one publication in each of the official newspapers of the City of Gloversville.

Mill Tanks Constructed.

During 1907 and 1908 twenty-six tanks were built in conformity with the foregoing ordinance although many of them were completed and in use before the law was passed.

The list in Table X indicates the tanneries at which tanks have been built, or which are provided for in common with others, together with the estimated quantity of refuse in gallons, the dimensions of the tanks, and their capacity when full to the elevation at which the water stands when the tanks are in use.

TABLE X.

Mill Settling Tanks Constructed.

No. of Mill.	Gals. of Sewage Discharged by Mill, per day.	Dimensions of Tank.	Capacity of tank in Gals.
1	7,000	11' long, 13' wide, 4½' deep	4817
2	10,000	11' long, 13' wide, 3½' deep	3747
3	5,000	16'x16'x 3' deep	5744
5	17,000	11'x 8'x4½' deep	2962
6	18,000	36'x 4'x 4' deep	19627
		32'x16'x 4' deep	
7	2,000	12'x4½'x 3' deep	1211
8	75,000	21'x13'x2½' deep	5105
9	25,000	13'x13'x 5' deep	6320
10	15,000	22⅝'x12'x4⅝' deep	9934
		3'x0.8'x 2' deep	
12	27,000	Wastes pass thro' tank used by Surpass Leather Co.	
13	80,000	*Tannery burned July, 1908	
14	30,000	20'x8'x5' 11'x 7'x3'	19792
		20'x8'x4' 13'x15'x5'	
15	30,000	9'x13'x4½' 9'x13'x4½'	7884
16	280,000	No tank built. Not connected to trunk sewer.	
17	15,000	9½'x 6'x4½' deep	1930
18	65,000	23'x25'x 4' deep	17204
19	5,000	8'x 8'x 5' deep	2393
20	30,000	No tank built. Only part of wastes enter sewer.	
21	25,000	25' x26' x6' deep	29172
22	72,000	60' x15' x4' "	26928
23	24,000	23' x10' x5½' "	9562
24	15,000	13' x13' x3½' "	4428
25	20,000	12½'x 4½'x2½' "	1052
26	20,000	13' x13' x3½' "	4428
27	20,000	11' x12' x4' "	3949
28	20,000	No tank	
29	6,000	Small tank	

* This company is doing business in quarters rented from the Daniel Hays Co.

* For name of mill see Table 8.

QUALITY OF INFLUENT AND EFFLUENT OF MILL TANKS.

Several analyses have been made to show the character of influent and effluent from tanks located at the various tanneries, the results of which are shown in Table XI.

These analyses were made during August, September, and October, 1907, and the following spring. In most cases each of the samples was made up of 40 portions taken at intervals of fifteen minutes during the working day of ten hours. In all cases the oxygen consumed and suspended matter were determined, and in several of the samples, the nitrogen present as organic nitrogen, and as free ammonia, was also determined. The methods of analysis employed were the same as those used for analysis of sewage.

In considering the results of the analyses of tank effluent, due allowance should be made for the fact that at some of the tanneries the tanks were nearly empty and therefore doing very good work, whereas at other mills the sludge had accumulated to such an extent that the efficiency of the settling tanks was low.

The strength of the influent and effluent from the different mill tanks varied greatly, that from the Filmer Bros. mill on August 23, 1907. being extremely dilute, a marked exception to the wastes usually discharged from the tanneries. It will be seen that the carbonaceous organic matter present in these wastes as shown by Oxygen Consumed, varied from 14 to 1318 parts per million. Expressing this variation in another way, it appears that the carbonaceous organic matter in the influent of the Filmer Bros. tank on August 23, 1907, was about 1% of that present in the influent to the tank of Rogers & Smith on August 22, 1907.

The most efficient sedimentation, as shown by Oxygen Consumed, appears to have taken place April 27, 1908, in the tank of Hall & Johns where 72% of the carbonaceous matter was thus removed from the liquid wastes.

The most important determination for showing the character of these wastes, as relating to their purification, is that of the suspended matter. As in the case of carbonaceous matter, it is found that solids in suspension vary greatly, ranging from 5 to 2740 parts per million. The most efficient sedimentation took place in the Bartlett tank, where 92% of the total suspended solids were removed, and 93% of the volatile suspended solids.

The proportion of suspended matter which is made up of organic substances is very variable in the different mill wastes. For the most part it appears that the inorganic matter is not in excess of the organic matter, although there are a few exceptions to this statement. On the contrary, in several of the samples, the organic matter is found to be greatly in excess of the inorganic matter,—as for example, in the influent to the Rogers & Smith tank, where about 83% of the suspended solids are organic in nature.

The nitrogent present in the form of Free Ammonia is in most cases somewhat less in amount than that found in ordinary domestic sewage, although in a few cases it is rather higher in amount. There is in some cases a slight increase in the amount of Free Ammonia in the effluent over that present in the influent, indicating some slight septic action in the settling tanks.

The amount of organic nitrogen in the influents is considerably in excess of the amount present in domestic sewage. That is as would be expected, and undoubtedly comes from the bits of flesh and the extracts from the hides. There is a marked reduction in the amount of organic nitrogen in the efflu-

ents, indicating that it was present largely in the form of suspended matter, and has been removed by sedimentation during the passage of the wastes through the tanks.

In Table XII are shown the amounts of suspended matter retained in the various tanks, calculated from the analyses of Table XI. The great variation in the amount of suspended matter in the various mill wastes is quite apparent, and more correctly observed from this table than from Table XI of analyses, because the third, fourth and fifth columns take into account not only the strength of the liquors, but also their volume.

TABLE XII.

Amount of Suspended Matter in Influents and Effluents, and Amount Retained in Mill Settling Tanks, Calculated as Sludge Containing 10% Solid Matter.

(Computation Based upon Analyses of Most Representative Samples Recorded in Table XI.)

Location of Tanks.	Water Used Gals. p. day.	Tons of Wet Sludge per Million Gallons.			
		Influent.	Effluent.	Retained in tanks.	Per cent. Retained
1	7,000	103	8	95	92.2
2	10,000	30	18	12	40.0
3	5,000	69	19	50	72.5
10	15,000	12	3	9	75.0
7	2,000	44	20	24	54.6
5	17,000	0.2	0.04	0.16	80.1
6	18,000	24	9	15	62.5
8	75,000	19	16	3	15.8
9	25,000	12	8	4	33.3
12	27,000	19	9	20	69.0
13	80,000	12	4	8	66.7
14	30.000	115	65	50	43.5
15	30.000	13	12	1	7.7
18	65.000	97	34	63	65.0
20	30.000	58	44	14	24.2
21	25.000	88	19	69	78.4
23	24.000	12	11	1	8.3
24	15.000	55	35	20	36.4
22	72.000	29	9	20	69.0
25	20.000	29	16	13	44.9
27	20.000	36	32	4	11.1

Note: No. 3 computed from a later analysis than that given in Table XI.

It appears from the figures given in Table XII, which unfortunately are based in most cases upon a single series of analyses, that the wastes contain a maximum of 115 tons of wet sludge per million gallons, and vary from that to an almost insignificant amount of 0.2 of a ton, or 400 pounds per million gallons.

The several effluents from the mill tanks vary nearly as widely in the amount of wet sludge contained, as do the influents to the tanks, the maximum amount of 10% sludge being 65 tons per million gallons. The amount of sludge retained in the settling tanks, figured per million gallons of mill wastes, amounted to 95 tons in the case of the greatest amount removed. Several of the tanks have removed from 60 to 70 tons of sludge per million gallons.

To make this subject more easily understood, Table XIII has been prepared, showing the pounds per day of wet sludge present in the mill wastes;

the amount retained in the tanks; the amount escaping therefrom with the effluent; the amount which could under practical conditions be removed by the tanks; and the corresponding amounts which would under those conditions pass out of the tanks with the effluents, together with the difference between the amounts discharged under the conditions existing at the time the analyses were made and under the assumed conditions which would make possible a removal of 70% of the suspended matter.

From Table XIII it appears that the maximum amount of sludge retained in any one mill tank, as shown by the analyses under discussion, was 8,260 pounds per day. Three of the tanneries retained from 3,000 to 3,500 pounds per day, while several others yielded 1,000 pounds. The total amount of sludge retained in the mill tanks was 25,783 pounds, whereas that carried out of the tanks in the effluent amounted to 22,494 pounds. Without doubt, this amount of solid matter escaping with the wastes can be greatly reduced by the proper cleaning and operation of the tanks.

TABLE XIII.

Quantity of Suspended Matter Actually Retained in Mill Settling Tanks.

Compared With That Which Would Have Been Retained Had Tanks Shown An Efficiency of 70% Removed.

(Computation based upon Analyses of Most Representative Samples Recorded in Table XI.)

(Pounds per day of Sludge assumed to contain 10% of Solid Matter.)

Location of Tanks.	Influent.	Retained.	Effluent.	Retained on assump. of 70% removal.	Effluent on assump. of 70% removal.	Difference between actual and assumed effluents.
1	1442	1330	112	1009	433	-321
2	600	240	360	420	180	80
3	690	500	190	483	207	-17
7	176	96	80	123	53	27
6	864	543	321	605	259	62
5	....	5.4	.....	.....	.....	....
8	2850	450	2400	1995	855	1545
9	600	200	400	420	180	220
10	360	270	90	252	108	-18
12	1566	1110	456	1096	470	-14
13	1870	1270	600	1310	560	40
14	6900	3050	3850	4830	2070	1770
15	850	150	700	595	255	445
18	12610	8260	4350	8830	3780	570
21	4440	3475	965	3108	1332	-367
23	594	84	510	416	178	332
20	3450	800	2650	2415	1035	1615
24	1650	606	1044	1155	495	549
22	4150	2934	1216	2905	1245	-29
26	1175	255	920	823	352	568
27	1440	160	1280	1008	432	848
	48277	25783	22494	33798	14479	8015

Note: Negative signs indicate that the amount retained in the tank, assuming an efficiency of 70%, would be less than the amount being retained under existing condition.

At a very conservative estimate 70% of solid matter can be retained in the tanks, and thus prevented from entering the sewer and being carried to the purification works. Accordingly, columns 5 and 6 have been calculated upon this assumption. The total amount of sludge retained upon this basis would be 33,798 pounds per day, as against 25,983 pounds actually retained at the time the test analyses were made. This illustrates very clearly the advantage and the necessity of securing an efficient inspection and operation of the mill tanks. It appears from this same table that had the tanks maintained an efficiency of 70% removal, the amount of suspended solids passing into the trunk sewer with the various effluents, would have been reduced from 22,000 pounds per day to 14,000 pounds,—a difference of more than 8,000 pounds.

It is not at all improbable that the efficiency of those tanks may be carried still higher than 70%, although for the purposes of this report the more conservative estimate has been used. As a matter of fact, some of the tanks have shown a much greater efficiency than 70% retained. It is quite likely that certain of the wastes are of such a character that an efficiency exceeding 70% cannot readily be realized, and that other wastes differing in quality can readily yield an effluent containing perhaps not more than 5 or 10% of the suspended solid matter of the corresponding influent.

The tanks have all been in use at least one year, and the results obtained have in several instances been quite disappointing. While, as already stated, it is entirely practicable to remove 70% of the suspended matters by means of these tanks, it is doubtful if the efficiency of the past year has averaged over 50 per cent. In the winter much difficulty was experienced in removing the sludge, and even under the more favorable weather conditions of the remainder of the year, the work of cleaning has not generally been attended to with the promptness and care which is necessary to secure a reasonable degree of efficiency. Few of those in authority at the several tanneries realize the importance of prompt action, and after being notified of the necessity of immediate cleaning, at times allow as much as three weeks to elapse before beginning the work. Under good business conditions some of the tanks will fill with sludge in about three weeks, so that a delay of the kind cited means that a very large proportion of the solid matter of the mill wastes is being discharged into the sewers. This has happened to such an extent in at least one case that the connecting branch sewer, 18 inches in diameter, was completely blocked with solid matter.

The tanks have been inspected from time to time and the owners notified of the conditions found to exist. Inspection alone, however, will not keep the tanks in proper condition, and a genuine co-operation on the part of the proprietors of the tanneries is most essential to success.

A Fixed Number of Parts per Million of Suspended Matter as the Proper Standard for the Effluents from Mill Settling Tanks.

The discussion of the efficiency of the mill settling tanks has thus far been based largely upon the per cent. of suspended matter removed from the wastes during their passage through the tanks. While this method is satisfactory for fixing a standard of efficiency of a given tank, it is not altogether

satisfactory as a method of establishing a standard for the quality of the effluents from the various tanks. Any standard based upon the per cent. of removal of suspended matter allows for wide fluctuations in the quantity of suspended matter in the several effluents according to the quantity present in the corresponding influents. If then it would be possible to fix upon a given number of parts per million as a standard for effluents, the results would be much better. With this standard it would be necessary that each mill so operate its tank as to secure a degree of efficiency which will assure an effluent containing not over the standard number of parts of suspended matter. It would seem that a reasonable standard should correspond approximately with the number of parts of suspended matter in ordinary city sewage which does not receive industrial wastes. A fair standard upon this basis would be 300 parts per million of suspended matter, and it would seem that the City Council would be entirely justified in passing a resolution to the effect that no mill wastes should be turned into the sewers which contain more than 300 parts per million of suspended matter.

Turning again to Table XI, it appears that in several cases the wastes from the various mills have been so reduced in suspended matter by means of the tanks that they would conform to this standard. Duplicate tests were made at several of the mills and in a number of these one of the tests has shown the suspended solids in the effluents to be as low as the standard. Such tests have proven that it is possible to reach the standard and in cases where it was not reached greater care in operation should have been exercised.

Character of Sludge Deposited in Mill Settling Tanks.

Table XIV is a compilation of the results of examination for density and analyses of sludge contained in mill settling tanks.

TABLE XIV.

Composition of Sludge Deposited in the Various Mill Settling Tanks.

In terms of dried sludge.

Source of Sample.	Date 1908	Specific Gravity.	Water %	Solid Matter %	Volatile Matter %	Fixed Residue %	Nitrogen %	Fats %
1	Apr. 24.	1.01	96	4	59	41	3.0	11
2	Mar. 23.	1.04	87	13	73	27	1.2	20
3	Mar. 17.	1.04	90	10	73	27	3.8	10
7	Mar. 17.	1.12	88	12	27	73	1.4	1.1
6	Mar. 10.	1.04	92	8	43	57	2.9	6.4
5	Mar. 25.	1.04	92	8	50	50	1.8	12
8	Mar. 20.	1.04	94	6	63	37	1.1	1.2
9	Mar. 20.	1.01	95	5	92	8	3.8	32
10	May 19.	1.19	69	31	89	11	0.78	–
22	Mar. 16.	1.02	95	5	53	47	2.5	5.8
13	Mar. 11.	1.04	91	9	41	59	1.4	16
14	Mar. 24.	1.08	87	13	27	73	1.8	2.9
15	Mar. 19.	1.02	97	3	63	37	3.8	4.9
17	Not in operation at time series were taken.							
16	No tank.							
18	Mar. 18.	1.14	79	21	89	11	1.2	0.99
21	Mar. 11.	1.19	70	30	18	82	1.0	0.45
23	Mar. 21.	1.04	90	10	55	45	2.1	4.4
24	No sludge in tank.							
26	Mar. 19.	1.04	93	7	42	58	2.3	4.5
27	Mar. 18.	1.03	93	7	60	40	1.2	5.4
19	Mar. 16.	1.02	95	5	52	48	2.[illegible]	5.0

There is a great variation in the density of the sludge which accumulates in the various mill tanks. That collected in the tank of the Daniel Hays Company contains only 69% water, while that from Mills Bros.' tank contains 97%. This variation is due in part to the length of time the sludge had been allowed to remain in the tank before sampling, and partly also to the character of the trade wastes. In general those wastes containing a large proportion of lime are the most dense, while those containing large quantities of aluminum salts are of very light specific gravity.

In general from 50% to 70% of the sludge consists of organic matter. In one case the proportion of organic matter was as high even as 92%, while in another case it was as low as 18%.

There is comparatively little nitrogen in the sludge from these tanks, the proportion not varying widely from that found in ordinary sewage sludge.

There was a very wide variation in the amount of fats contained in sludge, the highest being 32% while the lowest was 0.45%. This variation may be accounted for in part at least by a difference in the quality of the skins treated at the different tanneries. The sludge containing the highest amount was produced at a tannery at which buckskin is the only quality of hides tanned.

QUANTITY OF SEWAGE.

The quantity of sewage discharged from the trunk sewer at the experiment station has been measured from February, 1908, to July 1, 1909. The

results of the measurements showing the average flow for each day, when the gage was in good working order, are given in Appendix B.

In Table XV will be found the monthly averages of the daily flow of sewage, together with various data compiled from the measurements which have been taken during the period of time covered by the experimental work. The average daily flow has been 2.6 million gallons, while the average flow for week days has been 2.7 million gallons. The excess flow upon week days over that of Sundays and holidays, has been about 400,000 gallons. While the average flow has been but 2,600,000 gallons it is of importance to note that the maximum flow for a single day has reached as high as 7,500,000 gallons, and that the maximum flow for one day has exceeded 5,000,000 gallons during five different months covered by the measurements.

TABLE XV.

Measurements of Discharge from Outfall Sewer.

	Millions Gallons per Day.							
Months.	Month. Avg. for	Avg. for week days.	Avg. for Sundays and Holidays.	Inc. of Avg. for week days over that for Sundays and Holidays.	Max. for one day.	Min. for one day.	Max. rate.	Min. rate.
'08								
Feb.	2.6	2.7	2.4	0.3	5.2	2.0	7.9	1.1
Mar.	3.8	3.8	3.8	0.0	7.5	2.0	10.2	1.7
Apr.	3.5	3.5	3.2	0.3	5.7	2.6	8.1	1.0
May	3.1	3.3	2.7	0.6	4.5	2.6	3.9	1.0
June	2.3	2.3	2.3	0.0	2.6	1.8	6.6	1.1
July	2.1	2.1	1.8	0.3	2.4	1.6	3.5	1.1
Aug.	2.0	2.0	1.6	0.4	2.3	1.6	3.7	0.8
Sept.	1.8	1.9	1.4	0.5	2.2	1.4	6.6	1.1
Oct.	2.0	2.0	1.7	0.3	2.4	1.5	6.6	1.1
Nov.	1.8	1.9	1.5	0.4	2.1	1.4	3.6	1.0
Dec.	2.0	2.0	1.7	0.3	2.5	1.7	4.0	1.4
'09								
Jan.	2.2	2.3	1.9	0.4	2.8	1.6	6.6	1.2
Feb.	2.9	3.0	2.7	0.3	6.0	2.0	6.6	1.5
Mar.	3.0	3.0	2.7	0.3	4.8	2.1	6.6	1.6
Apr.	3.8	3.8	3.5	0.3	6.6	2.1	6.6	1.6
May	2.7	2.7	2.3	0.4	3.5	1.9	6.6	1.4
June	2.3	2.3	2.1	0.2	3.0	1.9	6.6	1.2
Avg.	2.6	2.6	2.3	0.35	3.9	1.9	6.1	1.2

The minimum rate of flow has been as low as 1,400,000 gallons, which is slightly over one-half of the greatest minimum flow of any day which was 2,600,000 gallons.

The maximum flow for one whole day varies greatly from the average flow, and the maximum rate of flow during the day varies greatly from the average for the 24 hours. This is very clearly shown in the 8th column of Table XV, which shows that the maximum rate of flow has never fallen below 3,500,000 gallons and has been as high as 10,200,000 gallons. A maximum flow of 6,600,000 gallons has been very common. The measurements of maxi-

mum rate of flow illustrate very forcibly, as do also those for the maximum flow for a single day, the effect of the admission of storm water to the sewers.

Periods of High Flow of Sewage.

In Table XVI have been compiled the number of consecutive days in each month during which measurements have been taken when the average flow for the day was in excess of the quantities specified. From this tabulation it appears that a rate of flow of 3,000,000 gallons or more may be expected for about two weeks in March and a similar length of time in April, during ordinary years. It is also significant to note that the rate of flow was as high as 4,000,000 gallons for ten consecutive days in March and six consecutive days in April, 1908; while in 1909 this rate was equaled or exceeded upon four days in March and ten days in April. Provision must therefore be made to care for these large flows for a considerable length of time during the months of March and April.

TABLE XVI.

Longest Period in Each Month When Station Sewage Flow Exceeded Specified Quantities.

Date.	Million Gallons per Day.									Days covered by record.
	2.0	2.5	3	3.5	4	4.5	5	6	7	
	Number of Days.									
1908 Feb.	13	3	1	1.	1	1.	1	.	.	13
Mar.	15	15	15	10	10	9	6	2	1	20
Apr.	30	30	16	12.	6	2.	2	.	.	30
May	15	15	3	2.	1	...	..	.	.	16
June	20	7	..	...	..	...	..	.	.	18
July	4	...	..	...	..	...	..		.	10
Aug.	6	...	..	...	..	...	..		.	29
Sept.	2	...	..	...	..	...	..	.	.	7
Oct.	3	...	..	...	..	...	..	.	.	31
Nov.	1	...	..	...	..	...	..	.	.	30
Dec.	6	1	..	...	..	...	..	.	.	31
1909 Jan.	13	3	1	...	..	...	..	.	.	31
Feb.	14	10	8	4	2	2.	2	1	.	25
Mar.	31	10	8	7.	4	3.	1	.	.	31
Apr.	30	17	15	15	10	9.	7	4	.	28
May	29	8	2	...	..	...	..	.	.	31
June	19	3	..	...	..	...	..	.	.	30
Total	253	122	69	51	34	26	19	7	1	411 Days.

TYPICAL HOURLY FLOW OF DOMESTIC SEWAGE AND MILL WASTES.

In Table XVII have been compiled the results of gagings of the flow of sewage taken every fifteen minutes throughout one day. Four gagings have been combined each hour, representing the flow for that hour. It appears that during this typical period the flow of domestic sewage amounted to approximately 1,485,000 gallons per day, while that from the tanneries amounted to 520,000 gallons, making the total daily flow of station sewage slightly over 2,000,000 gallons. Important data from these measurements may be tabulated as follows:

Domestic Sewage.

Domestic Sewage	74%	total flow
Minimum rate of flow	73%	average rate of flow
Maximum " " "	125%	" " " "
" " " "	172%	minimum " " "

Mill Sewage.

Mill Sewage	26%	total flow
Minimum rate of flow	18%	average rate of flow
Maximum " " "	208%	" " " "
" " " "	1163%	minimum " " "

Mill and Domestic Sewage Combined.

Minimum rate of flow	60%	average rate of flow
Maximum " " "	142%	" " " "
" " " "	237%	minimum " " "

Note: Two tanneries and a hair mill not yet connected to intercepting sewer.

The variation in flow of mill wastes is large. The minimum flow is between three and four o'clock in the morning, when it is 0.75% of the total flow for the day, while the maximum flow occurs between eleven and twelve o'clock in the forenoon and amounts to 8.68% of the total daily flow. The increase in flow of mill sewage is most marked between seven and eight o'clock in the morning, and thereis a decided reduction in flow between one and two o'clock in the afternoon. The decrease appears to be somewhat gradual between six and twelve o'clock in the evening. The flow of mill wastes for twelve hours from 6 a. m. to 6 p. m. amounts to 76.5% of the total wastes for the day. It is interesting to note that the wastes from the mills are present in the sewage throughout the night and that they are present in considerable quantity between 6 and 12 p. m. The minimum proportion present at any time was 7.8% and the maximum was 40% of the total flow of domestic and mill sewage:

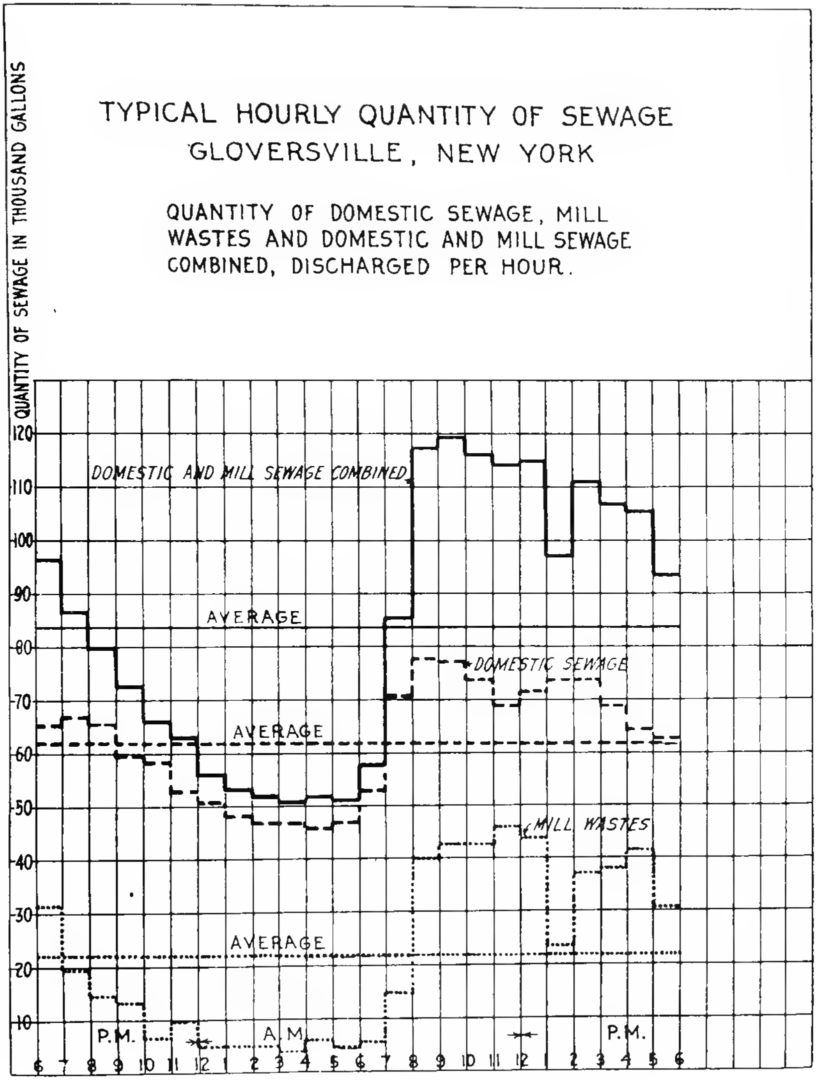
TABLE XVII.

Typical Hourly Week Day Flow of Domestic Sewage, Mill Wastes and Total Sewage Received at Station.

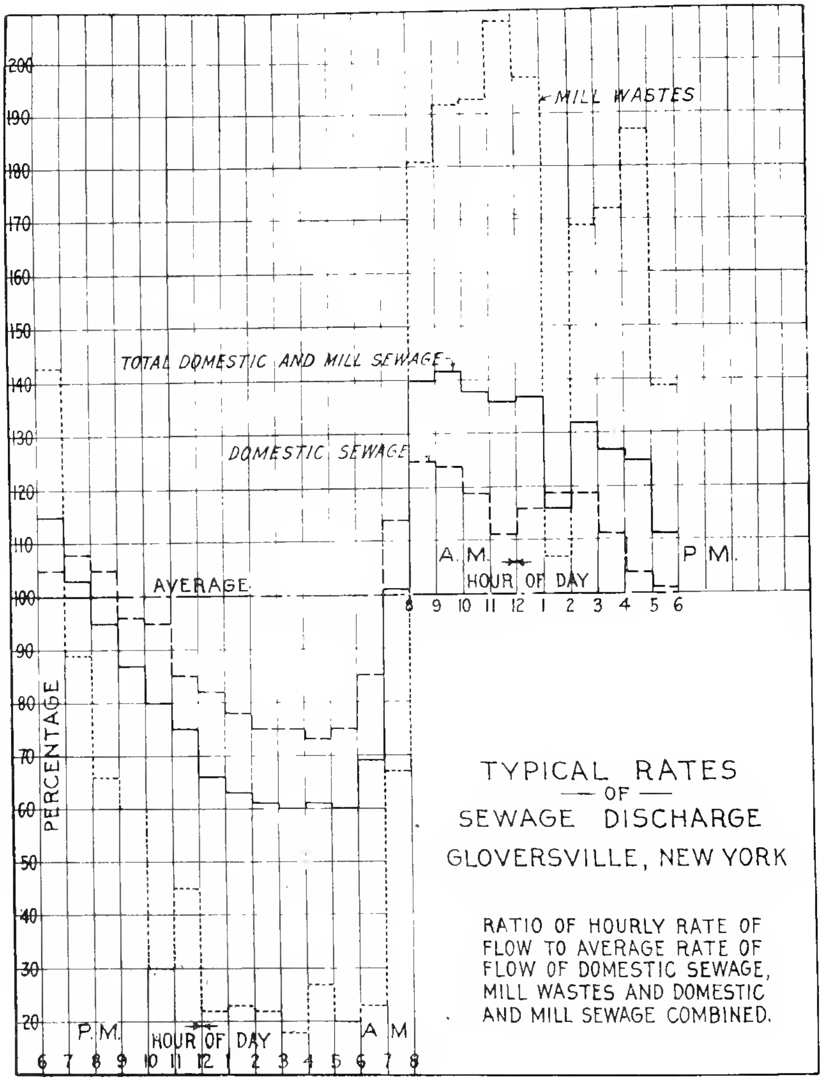
(Gagings taken every fifteen minutes)

Period.	Domestic Sewage. Domestic Sewage. (Gallons).	Ratio of hourly flow to total flow. (Per cent.)	Ratio to hourly rate to average rate of flow. (Per cent.)	Mill Wastes. Mill waste. (Gallons).	Ratio of hourly flow to total flow. (Per cent.)	Ratio of hourly rate to avg. rate. Per cent.)	Total Sewage. Total Sewage flow. (Gallons).	Ratio of hourly flow to total flow. (Per cent).	Ratio of hourly rate to avg. rate of flow. (Per cent.)	Ratio of mill waste to total flow. (Per cent.)
6-7 P.M.	64,893	4.37	105	31,402	5.96	143	96,300	4.79	115	32.6
7-8	66,513	4.48	108	19,587	3.72	89	86,100	4.28	103	22.8
8-9	65,167	4.39	105	14,433	2.74	66	79,600	3.96	95	18.1
9-10	59,511	4.01	96	13,139	2.49	60	72.650	3.61	87	18 1
10-11	58,704	3.95	95	6,596	1.25	30	65,300	3.24	78	10.1
11-12	52,780	3.56	85	9,920	1.88	45	62,700	3.12	75	15.8
12-1 A.M.	50,626	3.41	82	4,874	0.92	22	55,500	2.76	66	8.8
1-2	47,932	3.23	78	4,968	0.94	23	52,900	2.63	63	9.4
2-3	46,317	3.12	75	4,883	0.93	22	51,200	2.54	61	9.5
3-4	46,317	3.12	75	3,933	0.75	18	50,250	2.50	60	7.8
4-5	45,240	3.05	73	5,960	1.13	27	51,200	2.54	61	11.6
5-6	46,317	3.12	75	4,383	0.83	20	50,700	2.52	60	8.7
6-7	52,789	3.55	85	5,120	.97	23	57,900	2.88	69	8.8
7-8	70,283	4.73	114	14,817	2.81	67	85,100	4.23	101	17.4
8-9	77,553	5.22	125	39,697	7.53	181	117,250	5.83	140	33.9
9-10	77,016	5.19	124	42,234	8.01	192	119,250	5.93	142	35.4
10-11	73,513	4.95	119	42,337	8.05	193	115,900	5.76	138	36.6
11-12	68,667	4.63	111	45,733	8.68	208	114,400	5.69	136	40.0
12-1 P.M.	71,639	4.82	116	43,170	8.19	197	114,800	5.71	137	37.6
1-2	73,513	4.95	119	23,387	4.44	107	96,900	4.81	116	24.1
2-3	73,783	4.97	119	37,017	7.02	169	110,800	5.51	132	33.4
3-4	68,667	4.63	111	37,733	7.16	172	106,400	5.29	127	35.5
4-5	64,091	4.32	104	41,109	7.80	187	105,200	5.23	125	39.0
5-6	62,744	4.23	101	30,556	5.80	139	93,300	4.64	111	32.7
Total	1,484,562	....	...	527,038	....	...	2,011,600	....	...	26.2
Avg. Hourly Flow	61,869	4.16	100	21,960	4.16	100	83,820	4.17	100	....

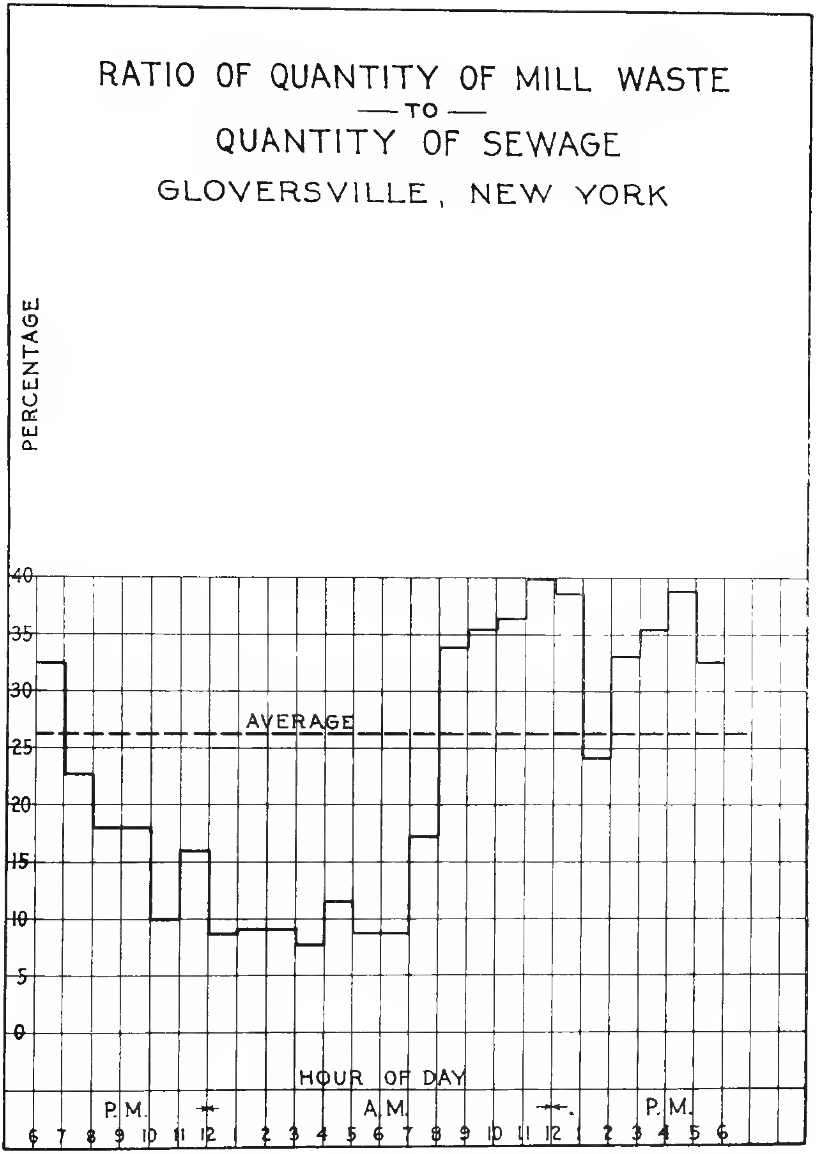
Note: This table is made up from measurements of domestic sewage taken on one day, October 30, 1906, and measurements of domestic and mill sewage combined as it flowed from the intercepting sewer on one day, Sept. 12, 1907. The quantities of mill sewage are the differences between the measurements of domestic and total flows. While it would be desirable to have measurements covering a longer period of time, it is believed that the figures given represent fairly the respective flows for dry weather and ordinary conditions, but of course do not include the wastes from the mills of E. S. Parkhurst Co., E. W. Starr and a part of those from S. H. Shotwell & Son.



TYPICAL HOURLY QUANTITY OF SEWAGE
GLOVERSVILLE, NEW YORK
QUANTITY OF DOMESTIC SEWAGE, MILL WASTES AND DOMESTIC AND MILL SEWAGE COMBINED, DISCHARGED PER HOUR.
QUANTITY OF SEWAGE IN THOUSAND GALLONS
DOMESTIC AND MILL SEWAGE COMBINED
AVERAGE
DOMESTIC SEWAGE
AVERAGE
MILL WASTES
AVERAGE
120
110
100
90
80
70
60
50
40
30
20
10
P.M.
A.M.
P.M.
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6



TYPICAL RATES
OF
SEWAGE DISCHARGE
GLOVERSVILLE, NEW YORK
RATIO OF HOURLY RATE OF FLOW TO AVERAGE RATE OF FLOW OF DOMESTIC SEWAGE, MILL WASTES AND DOMESTIC AND MILL SEWAGE COMBINED.
MILL WASTES
TOTAL DOMESTIC AND MILL SEWAGE
DOMESTIC SEWAGE
AVERAGE
PERCENTAGE
P.M.
A.M.
HOUR OF DAY
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8
8 9 10 11 12 1 2 3 4 5 6


RATIO OF QUANTITY OF MILL WASTE
— TO —
QUANTITY OF SEWAGE
GLOVERSVILLE, NEW YORK
PERCENTAGE
40
35
30
25
20
15
10
5
0
AVERAGE
HOUR OF DAY
P.M.
A.M.
P.M.
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6

In a general way, the quantity of mill wastes is sufficient to influence the proportionate hourly total flow at the station, although not sufficient to completely control it. For example, the maximum rate of total flow for the day is between nine and ten o'clock in the forenoon, corresponding to the period of maximum flow of domestic sewage, whereas the maximum rate of flow of mill wastes is between eleven and twelve o'clock in the forenoon. The variations in total flow, however, from nine o'clock until five o'clock are comparatively small. The reduced rate of flow of wastes between one and two o'clock, corresponding to and one hour later than the noon hour, is sfficient to cause a marked reduction in the total flow during that same period of time.

Diagram No. 1 shows the typical hourly quantity of sewage and is derived from Table XVII. The three lines on the diagram show respectively typical quantities of mill wastes, domestic sewage and domestic and mill sewage combined, for each hour of the day.

Diagram No. 2, also made up from Table XVII, shows the ratio of the hourly rate of flow to the average rate of flow of domestic sewage, mill wastes and domestic and mill sewage combined.

Diagram No. 3, shows the ratio of the quantity of mill wastes to the quantity of sewage for each hour of the day. From this diagram the gradual reduction of the proportion of mill wastes in the sewage during the evening and the marked and rapid decrease during the early morning hours, is readily seen.

CHARACTER OF CRUDE SEWAGE.

As has already been briefly explained, the character of the sewage of the City of Gloversville is essentially different from that of most cities because of the large proportion of the flow which consists of the refuse discharged into the sewers from the tanneries, hair, silk and knitting mills. At the present time, all of the tanneries, except those of E. W. Starr and S. H. Shotwell & Son (in part) are connected with the trunk sewer. The hair mill of E. S. Parkhurst & Co. has not yet been connected.

The sewage received at the experiment station from the trunk sewer will hereinafter be termed "Station Sewage," and may be considered as fairly representing the character of the sewage which will ultimately be received at the disposal plant.

The condition of business, as would be expected, has a marked effect upon the character and quantity of mill refuse discharged into the sewers. This has been very noticeable during the past year, when business has been comparatively quiet. For that reason,, the quantity and strength of the sewage as shown by analyses and measurements reported at this time may be somewhat below the average for the same population and industries for future years.

The connection of the tanneries and hair mill, not now contributing to the flow, will increase the daily quantity of sewage received in dry weather by about 315,000 gallons, or about 15%. These wastes will contain comparatively large amounts of lime and calcium sulphate, resulting from the use of sulphuric acid in the process of recovering and cleaning the hair. It is not believed, however, that they will materially change the character of the sewage

Daily Variation in Character of Sewage.

One of the early studies undertaken at the laboratory was that of the

variation in the character of sewage from day to day. A series of samples was taken and analyses made to show the composition of sewage during the month of November, 1907. Included in this study were three of each of the days of the week,—for example, three Mondays, three Tuesdays, etc. Table XVIII gives the results of analyses showing the average quality of sewage for each day in the week, as well as the average of analyses for the entire period and the average of the analyses for week days. The results of the individual analyses are also given.

The samples analyzed were each made up of 96 portions taken throughout 24 hours, thus forming composite daily samples. The samples were taken from the sewer at a point near the station.

As is natural, the average analyses of Sunday sewage show it to be more dilute than is that of any other day in the week.

The total organic nitrogen in the sewage on Sunday was found to be 6.8 parts, while during the week it varied from 14 to 18 parts. This increase on week days is doubtless due in part at least to the mill wastes.

The effect of the mill wastes upon the proportion of suspended to dissolved organic nitrogen, is clearly shown by the averages for Sunday and for the week days, the respective amounts upon the latter being practically the same, whereas the average for Sunday shows the amount dissolved to be only one-half as much as that in suspension.

There is comparatively little difference in the amount of free ammonia found in Sunday sewage and in sewage of the other days of the week. In fact, the tendency is toward a greater quantity of free ammonia on Sunday than during the other days. This is explained by the fact that the mill wastes are comparatively low in free ammonia, while domestic sewage contains a considerable amount of it. If therefore follows that a given amount of demestic sewage, containing a certain definite quantity of free ammonia, when diluted with mill wastes containing smaller quantities, will produce a total flow with smaller quantities than would be present if the sewage were undiluted with mill wastes. While the domestic sewage may contain more free ammonia upon week days than upon Sundays, this difference is not sufficient to offset the diluting effect of the mill wastes.

The fact that nitrites and nitrates were present in all samples is worthy of note, as indicating that the sewage was in what might be termed a fresh condition. This is probably due to two causes, namely,—

First; that the sewage finds its way quickly through the system of sewers and the intercepting sewer to the Experiment Station;

Second; that the chemicals contained in the mill wastes have a certain preservative effect upon the sewage, thus preventing decomposition.

The presence of some septic action, as indicated by the evolution of gas, has been frequently noted in some of the mill tanks. The natural result of such action, if at all general and abundant, would be to increase the amount of free ammonia and decrease the amount of nitrites and nitrates in the tank wastes. This action, however, appears to be only slight, and the comparatively small quantity of free ammonia in the mill wastes and the presence of nitrites and nitrates in the sewage at the station, indicate that there undoubtedly is a preservative and sterilizing action upon the sewage due to chemicals discharged from the tanneries. The sewage is, however, received in fresh condition, its time of flow through the intercepting sewer being but about 30

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minutes, and as there are no very long branch sewers, the period of flow through them would also be short.

The differences in the amounts of nitrites and nitrates found upon different days of the week are so small as not to be significant.

The amount of carbonaceous organic matter, as represented by oxygen consumed, appears to be much greater upon week days than holidays, that present on Sundays being only 40% of that present upon the average on week days. The fluctuation in amount during the week, however, does not appear to be great,—the average varying from 68 on Thursdays to 82 on Saturdays.

It is interesting to note that the proportion of dissolved and suspended carbonaceous matter on Sundays and on week days is practically the same, and that the amount dissolved is practically equal to the amount in suspension. The increased amount of carbonaceous matter present upon week days over that present upon Sundays, is readily explained by the presence of the mill wastes.

The great difference existing between the amount of chlorine present upon Sundays and upon week days, was to be expected, and is easily explained by the fact that large quantities of salt are used with the chemicals in the dehairing process to protect the grain of the leather.

The quantity of suspended matter present in the sewage upon week days is much more than that found upon Sundays, a natural result of the discharge of mill wastes, although the quantity of solid matter depends much upon the efficiency of the mill tanks. The proportion of organic and inorganic matter as shown by the volatile and fixed suspended matter present upon Sundays, and upon week days, varies considerably; the ratio of mineral matter to organic matter upon Sundays was found to be 20.5%, while upon week days it was 40%. This doubtless resulted from the large amount of inorganic chemicals present in the mill wastes, such as lime, alum, etc. These chemicals would tend to increase the proportion of inorganic matter, while upon Sunday they are absent and the sewage is practically all domestic sewage, the proportion of mineral matter would be comparatively small.

There is free lime present in the sewage at practically all times except upon Sundays and holidays, although during the latter part of the night the quantity is comparatively small. Even on Sundays there is occasionally present an excess of free lime, although usually there is a slight excess of free carbonic acid.

The amount of fats present upon week days, is just about double that present in Sunday sewage. This is a natural consequence of the treatment of the skins, although domestic sewage might also be expected to be slightly higher in fat during week days than upon Sundays.

In general, as in most cities, the sewage is more dilute upon Sundays than upon the other days of the week, but on the other hand, it is not markedly stronger upon Mondays or upon Saturdays as is frequently the case with ordinary city sewage. Even the fats are not materially higher upon Monday than they are upon Tuesday or Wednesday, and are substantially the same as upon Saturday. These conditions show that the mill wastes are present in sufficient quantity to nearly if not quite obscure the fluctuations in the quality of the domestic sewage.

Hourly Variation in Character of Crude Sewage.

To determine the fluctuations in the quality of the sewage received at the station from hour to hour throughout the day and to compare these fluctuations for the different days of the week, a series of analyses was made in November, 1907. Samples of sewage were collected each hour during the day and analyzed as soon as possible after collection. The study was started by collecting the samples for Monday and all were analyzed before the following Wednesday. Upon Tuesday of the second week, samples were taken and all were analyzed before the following Thursday. In this way the work was continued until complete hourly analyses had been made upon samples for each of the seven days of the week.

Tables XIX to XXV show very clearly and in great detail the variation in the character of the sewage from hour to hour throughout the 24 hours of each day in the week. While the variation in the strength of the sewage follows in a general way the usual rule for variation in the quality of sewages, the excess between the hours of 6 a. m. and 7 p. m. over that of the remainder of the day is more marked than usual, obviously on account of the large proportion of mill wastes.

The hourly fluctuations as shown by the individual chemical determinations may be more easily studied from Diagrams 4-9 than from the tables. These diagrams show the composition of the sewage on Sunday, Monday, Wednesday and Friday, the other days of the week having been omitted from the diagrams because the figures did not vary materially from the other week days, and on account of the complication caused by so many lines.

A mere glance at these diagrams is sufficient to show the very dilute and comparatively uniform character of the sewage between the hours of 12 night and 6 a. m. and to show the marked increase in strength from 6 to 8 a. m. In some cases the maximum strength is reached at 8 a. m., although in others is is not reached until 10 a. m. There is in most cases a marked reduction in strength immediately following the maximum strength. This reduction usually takes place about the middle of the forenoon and is followed by a rise, though not to the maximum, just prior to noon, say, at 11 or 12 o'clock. This rise is again followed by a marked decrease following the noon hour, which is in turn followed by an increase in strength, the high point of the afternoon usually being at 3 or 4 o'clock, from which time there is a gradual decrease until about 10 o'clock when some of the determinations show a slight increase for an hour or two.

The maximum amount of impurities as shown by the different determinations does not in all cases come at the same hour of the day,—for example, on Monday the total organic nitrogen was high at 9 o'clock, while the free ammonia was high at 8 o'clock, the total oxygen consumed at 9 o'clock, the chlorine at 11 o'clock, the total suspended matter at 11 o'clock and the alkalinity at 9 o'clock.

The hours at which the analyses show the various determinations to be highest on each of the seven days of the week, are shown in the following table:

TABLE XIX.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Parts per Million. Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3
Sunday,	12 P. M.	8.5	8.0	0.14	1.80	21.0	40	63	52	11	160
"	1 A. M.	7.7	5.8	0.12	1.42	16.0	32	43	42	11	152
"	2 "	5.5	3.8	0.11	1.22	13.0	27	32	28	4	144
"	3 "	1.7	2.8	0.09	1.55	9.4	25	20	18	2	128
"	4 "	2.1	1.8	0.05	1.38	7.4	23	27	22	5	122
"	5 "	1.7	1.6	0.05	1.49	6.8	22	18	16	2	116
"	6 "	1.4	1.6	0.05	0.98	6.4	21	11	11	0	126
"	7 "	1.9	1.6	0.05	1.28	7.6	23	9	9	0	128
"	8 "	6.9	19.0	0.32	0.00	20.0	41	75	60	15	206
"	9 "	12.0	29.0	0.00	0.00	35.0	51	115	89	26	240
"	10 "	17.0	31.0	0.00	0.00	37.0	64	176	146	30	252
"	11 "	10.0	26.0	0.00	0.00	56.0	70	219	184	35	136
"	12 M.	13.0	17.0	0.00	0.00	51.0	64	175	150	25	188
"	1 P. M.	8.9	16.0	0.00	0.00	47.0	58	145	116	29	188
"	2 "	8.4	16.0	0.00	0.00	42.0	70	144	119	25	180
"	3 "	6.5	17.0	0.00	0.00	44.0	60	143	123	20	184
"	4 "	8.1	15.0	0.00	0.00	43.0	54	130	109	21	176
"	5 "	5.3	15.0	0.12	0.01	36.0	48	92	71	21	170
"	6 "	6.2	13.0	0.60	0.11	26.0	49	82	61	21	158
"	7 "	6.6	12.0	0.57	0.10	26.0	42	97	73	24	166
"	8 "	6.8	11.0	0.40	0.53	23.0	41	62	45	17	166
"	9 "	7.5	10.0	0.32	1.30	23.0	41	55	43	12	166
"	10 "	3.7	13.0	0.45	0.00	20.0	42	58	51	7	172
"	11 "	2.7	12.0	0.20	1.70	15.0	38	42	38	4	166
Averages		6.7	12.5	0.15	0.62	26.0	44	85	70	15	166

TABLE XX.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter			Alkalinity in Terms of Ca Co 3
		Organic	Free Ammonia	Nitrates	Nitrites			Total	Volatile	Fixed	
		Parts per Million.									
Monday,	12 P. M.	2.6	6.5	0.10	2.30	8.8	32	21	18	3	164
"	1 A. M.	1.9	3.2	0.09	2.40	7.4	28	10	10	0	132
"	2 "	1.1	2.0	0.09	2.50	5.2	27	10	9	1	132
"	3 "	1.1	1.6	0.09	2.50	5 8	26	14	13	1	128
"	4 "	1.1	1.6	0.08	2.40	4.6	26	15	14	1	128
"	5 "	1.9	2.4	0.09	2.30	6.2	26	15	14	1	132
"	6 "	3.1	4.0	0.08	2.30	9.2	29	30	30	0	140
"	7 "	18.0	7.4	0.10	1.60	38.0	58	71	68	3	138
"	8 "	53.0	18.0	0.26	0.51	114.0	188	320	266	54	296
"	9 "	58.0	16.0	0.12	1.60	270.0	258	746	566	180	300
"	10 "	32.0	14.0	0.16	1.30	170.0	348	436	338	98	280
"	11 "	39.0	13.0	0.16	1.30	221.0	438	756	566	190	250
"	12 M.	32.0	12.0	0.12	0.76	150.0	273	450	264	186	250
"	1 P. M.	23.0	9.6	0.12	1.10	99.0	153	418	366	52	220
"	2 "	30.0	11.0	0.22	1.00	134.0	243	452	304	148	250
"	3 "	29.0	9.1	0.16	1.30	132.0	348	628	334	294	250
"	4 "	31.0	9.3	0.16	1.50	122.0	318	474	260	214	250
"	5 "	29.0	8.7	0.20	1.50	124.0	423	440	242	198	230
"	6 "	27.0	9.4	0.18	1.60	91.0	173	332	150	182	210
"	7 "	17.0	9.4	0.48	1.50	55.0	102	192	116	76	202
"	8 "	13 0	12.0	0.22	0.68	51.0	83	154	118	36	194
"	9 "	9 0	9.1	0.57	1.10	39.0	70	106	84	22	180
"	10 "	6.2	11.0	0.55	1.40	26.0	53	74	63	11	177
"	11 "	6.2	12.0	0.29	1.30	25.0	50	66	60	6	179
Averages		19 4	8.4	0.20	1.6	79.4	157	260	178	82	201

TABLE XXI.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Parts per Million. Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3
Tuesday,	12 P. M.	5.9	6.7	0.14	2.60	19.0	47	60	56	4	158
"	1 A. M.	4.0	4.1	0.10	2.80	14.0	42	27	26	1	152
"	2 "	2.5	2.6	0.07	2.40	10.0	34	25	24	1	150
"	3 "	2.2	1.9	0.06	2.50	8.8	32	21	19	2	150
"	4 "	2.4	1.9	0.06	2.60	8.4	33	21	21	0	142
"	5 "	2.9	2.2	0.06	2.60	8.0	26	21	18	3	146
"	6 "	4.1	4.2	0.07	2.50	11.0	63	24	24	0	152
"	7 "	27.0	13.0	0.08	1.90	53.0	100	129	110	19	200
"	8 "	41.0	18.0	0.06	0.87	112.0	241	373	237	136	175
"	9 "	44.0	15.0	0.06	1.00	158.0	356	555	362	193	310
"	10 "	32.0	12.0	0.13	0.88	145.0	291	431	254	177	290
"	11 "	26.0	9.9	0.11	1.50	114.0	311	483	273	210	275
"	12 M.	30.0	9.9	0.13	0.90	134.0	341	473	255	218	330
"	1 P. M.	26.0	12.0	0.40	1.10	108.0	206	285	220	65	320
"	2 "	25.0	13.0	0.35	1.10	123.0	228	356	279	77	260
"	3 "	24.0	8.7	0.14	....	130.0	273	402	200	202	190
"	4 "	33.0	8.4	0.08	....	135.0	258	490	222	268	310
"	5 "	27.0	9.0	0.18	....	119.0	523	340	188	152	230
"	6 "	26.0	8.7	0.12	1.10	157.0	178	342	176	166	210
"	7 "	21.0	9.0	0.10	1.40	72.0	84	278	149	129	184
"	8 "	15.0	9.0	0.12	1.20	64.0	68	127	103	24	224
"	9 "	12.0	8.7	0.16	1.30	44.0	68	92	73	19	204
"	10 "	5.5	12.0	0.50	0.63	24.0	47	66	60	6	180
"	11 "	7.2	11.0	0.44	1.50	19.0	51	55	51	4	174
Averages		18.6	8.4	0.16	1.43	75.0	163	228	142	86	213

TABLE XXII.

Crude Sewage Showing Hourly Variation.

1907 November and December.	Parts per Million.									
	Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter			Alkalinity in Terms of Ca Co 3
	Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed	
Wednesday, 12 P. M.	4.8	7.9	0.23	2.30	15.0	46	52	48	4	158
" 1 A. M.	2.9	4.4	0.14	2.50	9.2	41	19	17	2	145
" 2 "	1.8	2.9	0.12	2.80	8.1	39	17	13	4	141
" 3 "	1.6	2.4	0.10	2.90	9.0	38	20	18	2	146
" 4 "	1.6	1.9	0.45	3.00	8.7	40	15	13	2	142
" 5 "	1.7	2.3	0.45	3.00	9.0	37	13	13	0	141
" 6 "	4.7	4.4	0.11	2.90	10.0	37	27	22	5	144
" 7 "	20.0	14.0	0.16	2.20	40.0	56	112	93	19	206
" 8 "	39.0	9.6	0.12	1.80	113.0	203	534	246	288	190
" 9 "	36.0	7.7	0.14	1.50	135.0	308	678	304	374	220
" 10 "	24.0	9.4	0.18	2.40	114.0	263	684	290	394	220
" 11 "	28.0	7.6	0.10	0.50	142.0	213	588	276	312	230
" 12 M.	23.0	7.1	0.16	1.30	134.0	318	364	190	174	180
" 1 P. M.	15.0	7.3	0.02	1.40	86.0	133	158	126	32	200
" 2 "	17.0	8.0	0.10	1.50	124.0	173	426	206	220	210
" 3 "	31.0	8.6	0.10	1.20	128.0	298	539	263	276	315
" 4 "	25.0	8.7	0.10	1.30	115.0	228	434	200	234	325
" 5 "	21.0	7.9	0.46	1.20	94.0	224	304	159	145	241
" 6 "	17.0	9.4	0.28	0.70	67.0	148	197	121	76	222
" 7 "	18.0	9.3	0.12	1.30	58.0	80	140	117	23	184
" 8 "	15.0	11.0	0.12	1.40	57.0	66	140	120	20	144
" 9 "	9.0	10.0	0.12	1.40	40.0	70	90	79	11	168
" 10 "	3.7	13.0	0.50	0.17	26.0	67	98	85	13	180
" 11 "	3.7	17.0	0.48	0.95	22.0	63	46	43	3	180
Averages	15.0	8.0	0.20	1.73	65.0	133	237	127	110	193

TABLE XXIII.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Volatile	Fixed	Alkalinity in Terms of Ca Co 3
Thursday,	12 P. M.	2.6	7.7	0.16	2.20	16.0	54	31	28	3	160
"	1 A. M.	2.2	5.3	0.12	2.20	12.0	48	27	22	5	146
"	2 "	2.1	2.8	0.09	2.20	10.0	47	21	14	7	138
"	3 "	1.2	2.2	0.09	2.20	8.6	49	11	11	0	138
"	4 "	2.5	2.0	0.09	2.60	9.0	58	7	5	2	134
"	5 "	2.4	1.9	0.09	2.90	8.4	60	10	10	0	138
"	6 "	6.5	4.4	0.09	2.20	23.0	51	75	66	9	122
"	7 "	15.0	14.0	0.10	1.70	42.0	72	128	99	29	158
"	8 "	39.0	13.0	0.14	1.90	122.0	203	234	182	52	190
"	9 "	34.0	12.0	0.16	2.30	128.0	303	512	246	266	210
"	10 "	25.0	10.0	0.14	2.30	154.0	268	512	266	246	240
"	11 "	33.0	8.3	0.12	1.90	162.0	303	474	238	236	270
"	12 M.	19.0	14.0	0.30	0.58	113.0	233	320	250	70	220
"	1 P. M.	18.0	14.0	0.36	1.20	105.0	188	...	...	...	220
"	2 "	23.0	13.0	0.16	1.80	143.0	268	306	238	68	260
"	3 "	29.0	9.0	0.08	1.80	142.0	318	618	340	278	196
"	4 "	24.0	9.0	0.10	1.30	128.0	333	500	334	166	184
"	5 "	13.0	9.0	0.12	1.10	54.0	223	220	152	68	204
"	6 "	19.0	9.0	0.22	1.40	76.0	208	176	120	56	200
"	7 "	16.0	10.0	0.26	1.10	65.0	78	148	122	26	200
"	8 "	15.0	10.0	0.14	1.30	52.0	74	149	129	20	184
"	9 "	11.0	10.0	0.18	1.20	41.0	64	109	94	15	184
"	10 "	5.8	11.0	0.38	0.53	25.0	59	65	55	10	185
"	11 "	6.3	9.5	0.16	1.70	22.0	57	66	51	15	174
Averages		15.2	8.8	0.16	1.73	69.0	151	205	134	71	186

TABLE XXIV.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Parts per Million. Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Volatile	Fixed	Alkalinity in Terms of Ca Co 3
Friday,	12 P. M.	3.9	5.4	0.13	1.10	13.0	50	23	22	1	156
"	1 A. M.	2 0	3.7	0.09	2.50	11.0	46	18	17	1	146
"	2 "	1.9	2.4	0.09	2.60	8.9	43	13	11	2	142
"	3 "	1.9	2.3	0.09	2.30	8.5	38	15	14	1	142
"	4 "	1.8	2.1	0.08	2.30	8.0	39	15	14	1	134
"	5 "	1.9	2.0	0.07	2.50	8.5	38	22	15	7	136
"	6 "	4.5	4.0	0.07	2.50	11.0	41	32	30	2	149
"	7 "	24.0	14.0	0.11	1.90	45.0	87	132	115	17	195
"	8 "	31.0	14.0	0.12	1.50	100.0	178	188	122	66	300
"	9 "	34.0	15.0	0.08	1.70	114.0	293	544	190	354	240
"	10 "	37.0	11.0	0.03	2.00	116.0	333	384	296	88	100
"	11 "	31.0	9.3	0.08	2.20	134.0	398	536	266	270	200
"	12 M.	32.0	8.3	0.08	2.30	147.0	183	610	276	334	190
"	1 P. M.	20.0	8.4	0.10	2.70	113.0	113	296	186	110	180
"	2 "	21.0	13.0	0.08	1.70	125.0	211	269	202	67	219
"	3 "	21.0	15.0	0.12	1.00	134.0	298	360	260	100	200
"	4 "	19.0	11.0	0.10	1.20	127.0	248	360	254	106	176
"	5 "	23.0	9.0	0.10	0.42	158.0	243	380	226	154	184
"	6 "	25.0	13.0	0.10	0.42	102.0	218	352	172	180	196
"	7 "	21.0	9.0	0.12	0.65	64.0	114	156	126	30	212
"	8 "	15.0	11.0	0.16	0.85	61.0	86	206	160	46	188
"	9 "	9.4	12.0	0.16	0.92	41.0	80	123	102	21	176
"	10 "	7.8	10.0	0.43	1.30	26.0	57	94	73	21	179
"	11 "	6.0	11.0	0.21	1.70	22.0	54	67	54	13	178
Averages		16.5	9.0	0.12	1.68	71.0	145	216	133	83	180

TABLE XXV.

Crude Sewage Showing Hourly Variation.

1907 November and December.		Parts per Million. Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3
Saturday,	12 P. M.	3.8	7.9	0.22	2.20	15.0	51	40	32	8	169
"	1 A. M.	2.8	4.0	0.11	2.80	10.0	43	29	22	7	147
"	2 "	1.9	2.4	0.10	2.60	8.1	40	23	18	5	141
"	3 "	1.6	2.3	0.08	2.70	8.3	39	22	15	7	139
"	4 "	1.6	2.1	0.10	2.70	7.2	39	14	12	2	139
"	5 "	1.9	2.2	0.09	2.60	8.2	38	28	18	10	136
"	6 "	4.9	5.2	0.10	2.60	14.0	40	29	29	0	150
"	7 "	25.0	13.0	0.11	2.00	46.0	62	121	104	17	189
"	8 "	31.0	33.0	0.12	0.92	153.0	288	412	276	136	256
"	9 "	21.0	28.0	0.10	1.20	129.0	318	374	264	110	200
"	10 "	32.0	17.0	0.06	1.30	159.0	323	478	340	138	232
"	11 "	34.0	12.0	0.20	1.20	150.0	458	544	290	254	300
"	12 M.	30.0	10.0	0.22	0.96	129.0	298	396	234	162	250
"	1 P. M.	22.0	10.0	0.20	0.47	97.0	223	346	228	118	220
"	2 "	22.0	9.6	0.22	1.10	109.0	203	434	260	174	210
"	3 "	19.0	8.5	0.18	0.90	111.0	323	458	250	208	290
"	4 "	22.0	8.2	0.20	1.50	102.0	263	358	138	190	260
"	5 "	18.0	10.5	0.42	1.50	81.0	189	314	166	148	232
"	6 "	14.0	10.7	0.42	1.50	57.0	137	146	114	32	224
"	7 "	8.8	14.0	0.23	0.39	42.0	82	138	112	26	192
"	8 "	8.9	13.0	0.13	0.59	37.0	69	116	95	21	184
"	9 "	5.4	11.0	0.36	0.75	31.0	66	78	71	7	173
"	10 "	3.9	10.0	0.45	0.12	26.0	58	55	50	5	176
"	11 "	5.3	13.0	0.45	0.07	26.0	46	61	59	2	188
Averages		14.2	10.7	0.20	1.45	65.0	154	209	134	75	200

TABLE XXVI.

Time of Day When Various Constituents Were Found to be Present in Largest Quantities.

(Unless otherwise designated hours are A. M.; P—P. M.; M—Noon; N—Midnight.)

	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Org. Nitrogen..........	10	9	9	8	8	10	11
Free Ammonia..........	10	9	8	11p	7;12m:1p	9.3p	8
Nitrites..................	6	9p	10p	10p	10p	10p	10p,11p
Nitrates..........	12n	2;3	1	4;5	5	1p	1
Oxygen Con. Total......	11	9	9	11	11	5p	10
Chlorine...	11;2p	11	5p	12m	4p	11	11
Total Susp. Matter......	11	11	9	10	3p	12m	11
Volatile..................	11	9;11	9	9	3p	10	10
Fixed	11	3p	4p	10	3p	9	11
Alkalinity...............	10	9	12m	4p	11	8	11

Note: Where equally high results of analyses were obtained at two or more hours during the day, all such hours are recorded.

It appears that the greatest amount of organic nitrogen is present in the sewage in the forenoon, at hours varying from 8 to 11 o'clock. In general it would appear that the discharge of mill wastes causes a somewhat earlier high point in organic nitrogen than would be found with domestic sewage.

The maximum amount of free ammonia was found during the forenoon of every day, except Wednesday. when it was present at 11 p. m., although upon Thursday an equal amount was found at 12 o'clock noon and 1 p. m., and on Friday at 3 p. m.

Nitrites were found to be highest at 9 or 10 p. m. upon every day except Sunday, when the high point was reached at 6 p. m. On Saturday the amount present at 11 o'clock was equal to that present at 10 o'clock.

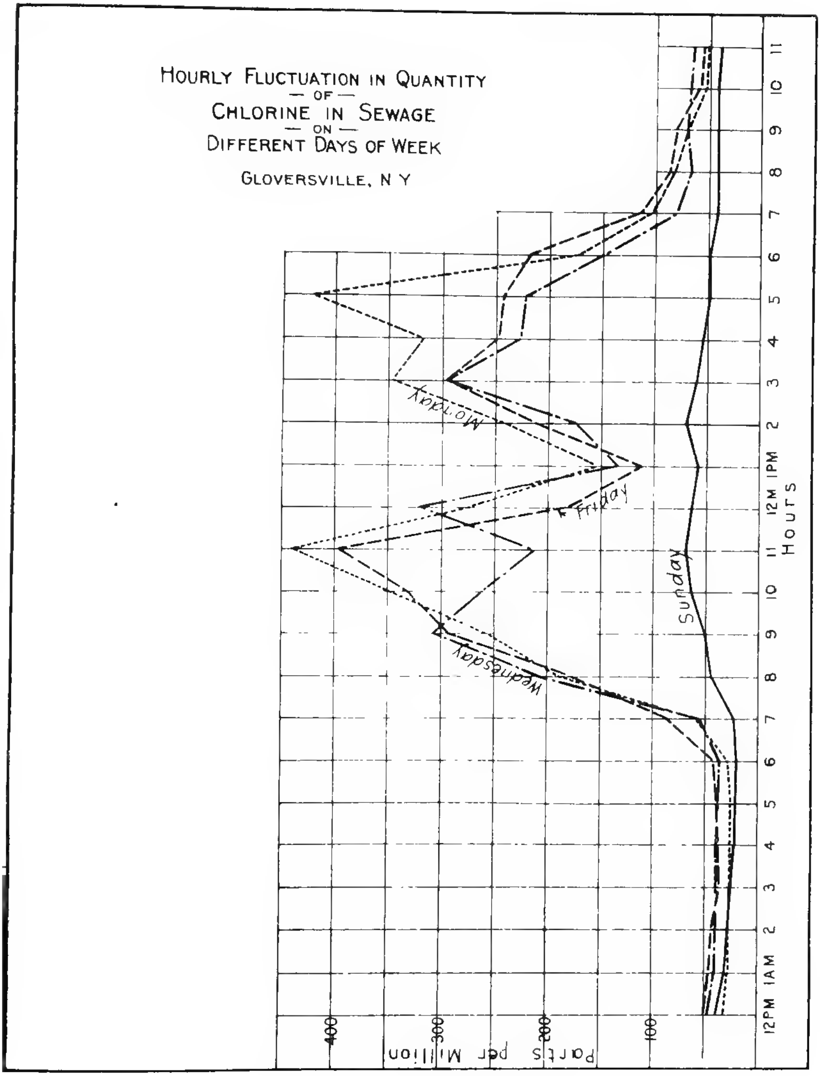
Nitrates were found to be highest in the vicinity of midnight, varying from 12 o'clock night to 5 a. m. Friday was an exception, the high point being reached at 1 p. m. The presence of high nitrates, and possibly of high nitrites may be accounted for in part by the presence of ground water in larger proportion at these hours than during the remainder of the day, and in part by the reduced proportion of decomposition due to bacterial action by which nitrates contributed by the ground water were reduced.

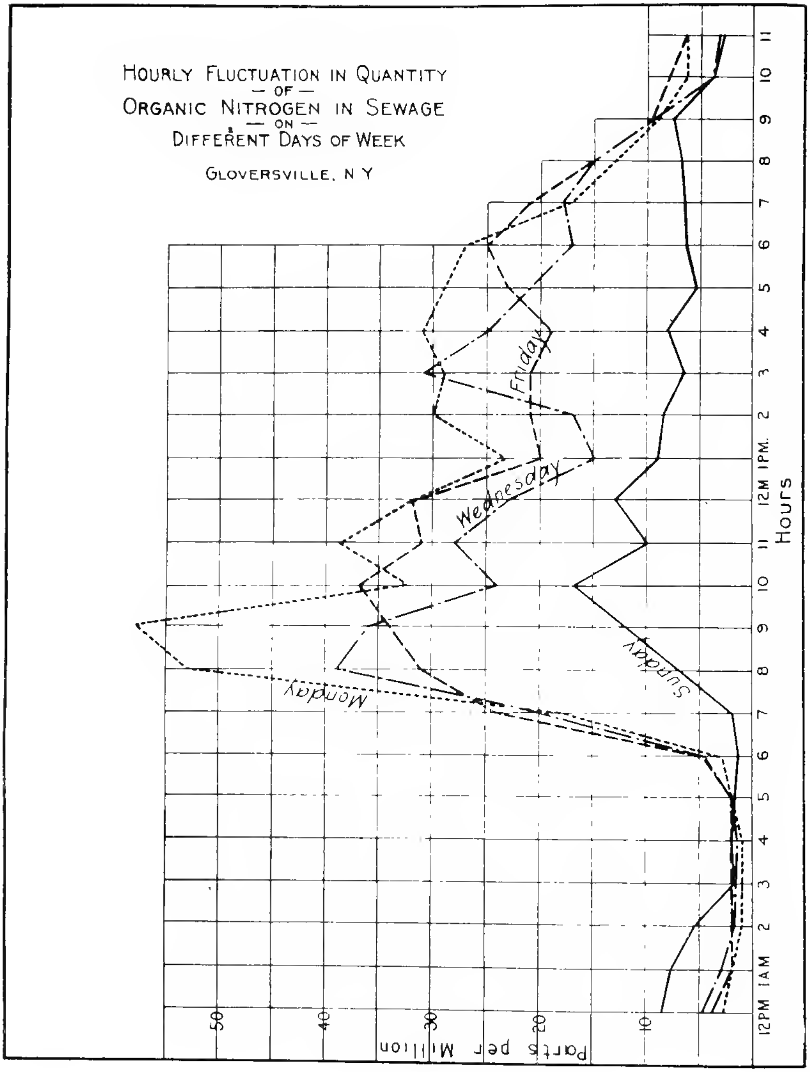
The maximum amount of carbonaceous organic matter as shown by the total oxygen consumed, was found to be present between the hours of 9 and 11 a. m., with the exception of Friday when maximum hour was 5 p. m.

The time at which the maximum amount of chlorine was found to be present varied quite widely. Uuon four days, Sunday, Monday, Friday and Saturday, the maximum point was reached at 11 a. m., upon Wednesday at 12 noon, upon Thursday at 4 p. m., and upon Tuesday at 5 p. m.

The maximum amount of total suspended matter was present between the hours of 9 a. m. and 12 o'clock noon upon all days except Thursday, when it was present at 3 p. m.

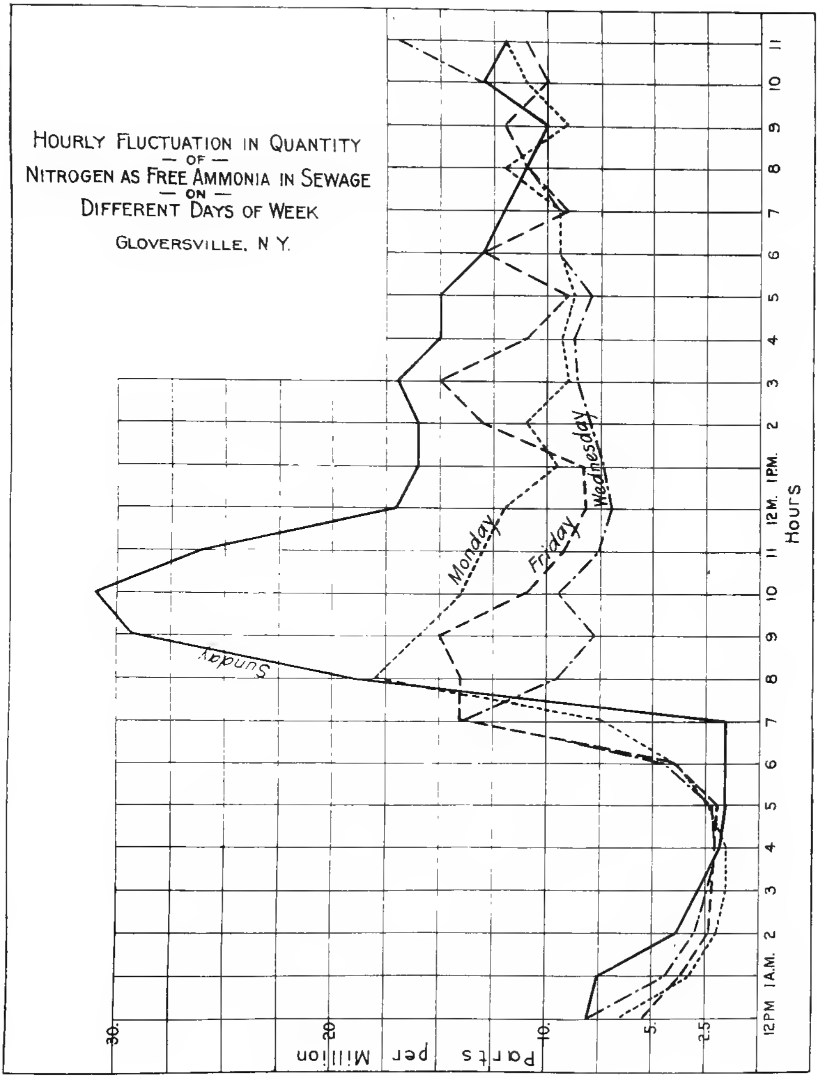
The maximum amount of volatile suspended matter corresponded as to time quite closely with the total suspended matter.


HOURLY FLUCTUATION IN QUANTITY
— OF —
CHLORINE IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK
GLOVERSVILLE, N. Y.
Monday
Friday
Wednesday
Sunday
12PM 1AM 2 3 4 5 6 7 8 9 10 11 12M 1PM 2 3 4 5 6 7 8 9 10 11
Hours
100
200
300
400
Parts per Million



HOURLY FLUCTUATION IN QUANTITY
— OF —
ORGANIC NITROGEN IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK

GLOVERSVILLE, N. Y.



HOURLY FLUCTUATION IN QUANTITY
— OF —
NITROGEN AS FREE AMMONIA IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK
GLOVERSVILLE, N. Y.
Sunday
Monday
Friday
Wednesday
Parts per Million
30.
20.
10.
5.
2.5
Hours
12PM
1A.M.
2
3
4
5
6
7
8
9
10
11
12M.
1P.M.
2
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6
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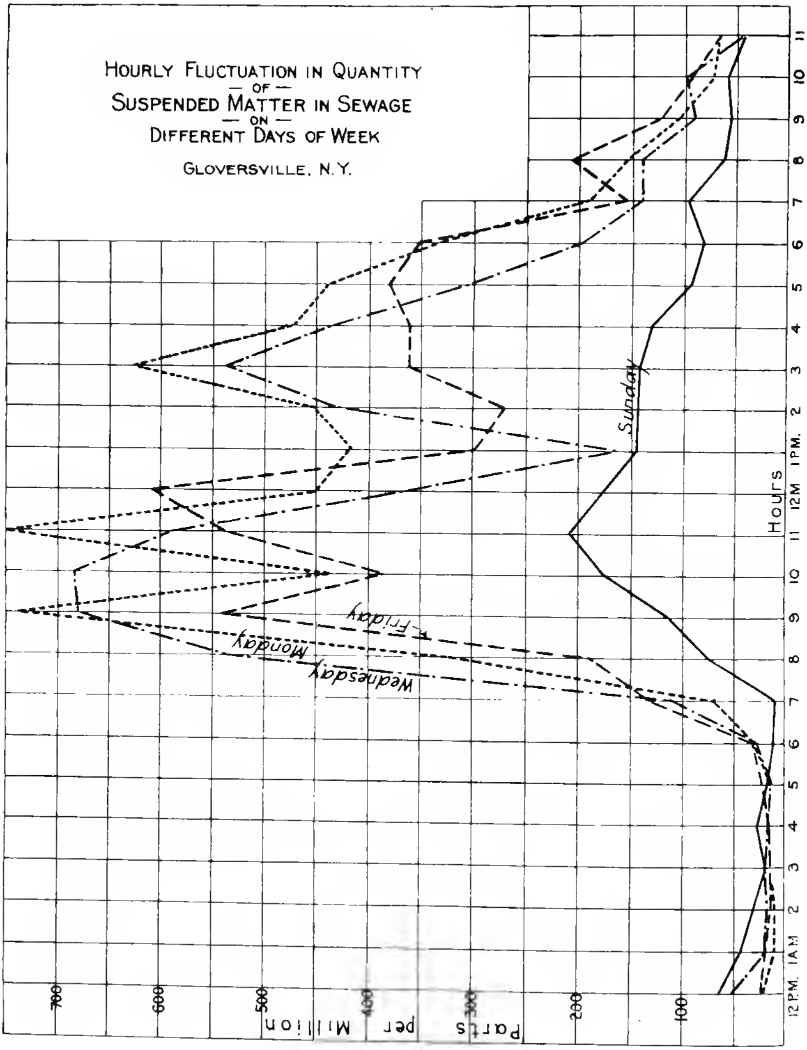
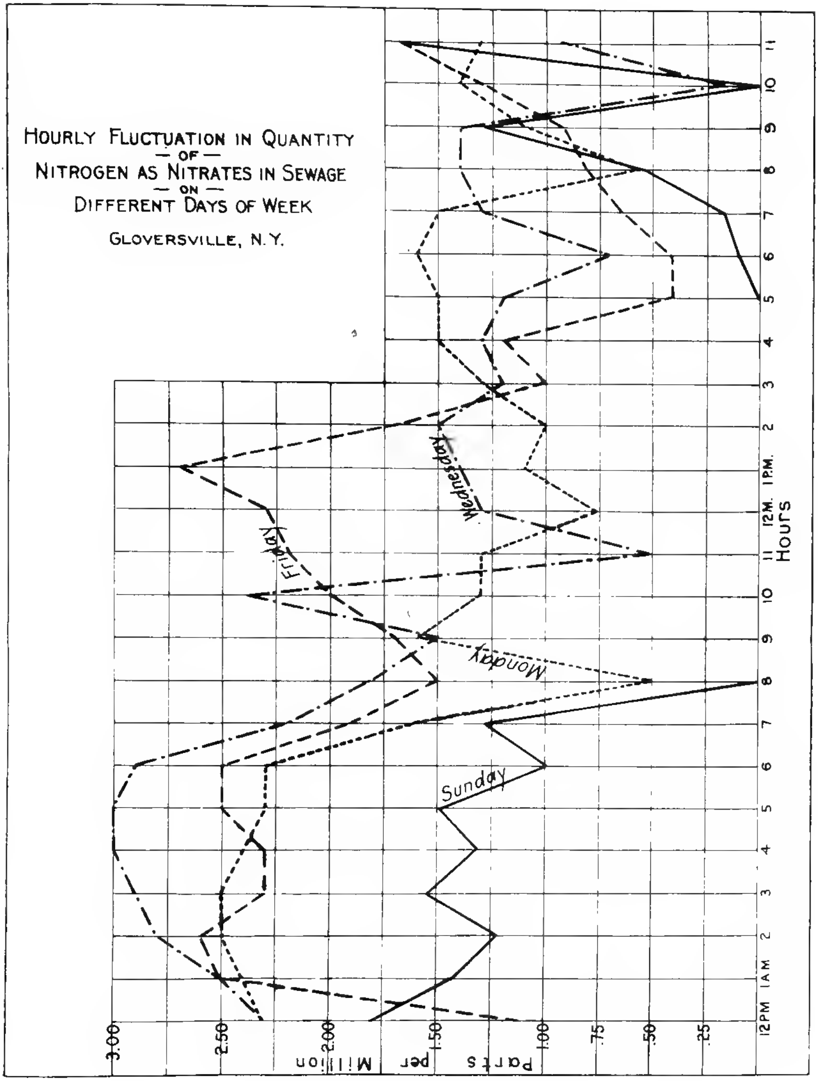
9
10
11



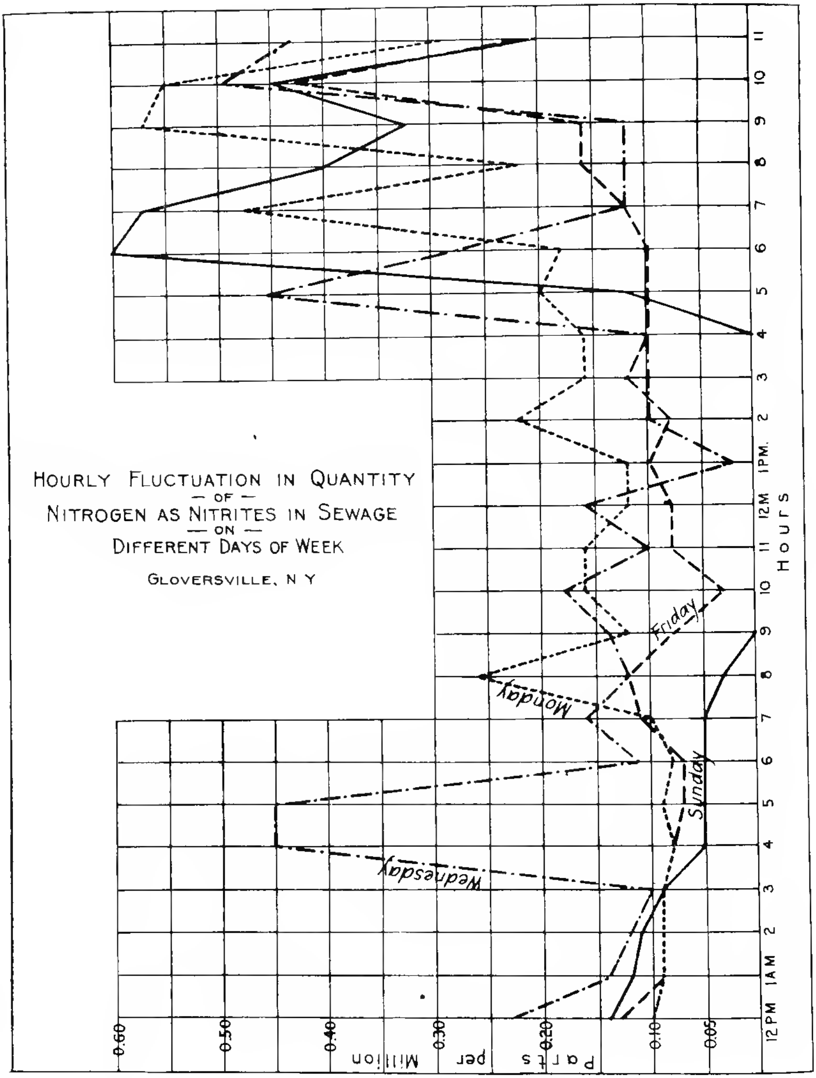
HOURLY FLUCTUATION IN QUANTITY
— OF —
SUSPENDED MATTER IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK

GLOVERSVILLE, N.Y.



HOURLY FLUCTUATION IN QUANTITY
— OF —
NITROGEN AS NITRATES IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK

GLOVERSVILLE, N.Y.



HOURLY FLUCTUATION IN QUANTITY
— OF —
NITROGEN AS NITRITES IN SEWAGE
— ON —
DIFFERENT DAYS OF WEEK

GLOVERSVILLE, N. Y.

The hours at which inorganic suspended matter was presence in maximum amount varied considerably, and in some cases did not appear to have any relation to the time at which the maximum amount of organic suspended matter was present.

The sewage was found to be most strongly alkaline in the forenoon upon five daws of the week, at noon upon Tuesday, and at 4 p. m. upon Wednesday.

While the variations in the time of maximum strength as shown by the various determinations were considerable, it was generally found that the sewage was strongest between the hours of 8 a. m. and 5 p. m. Practically the only exception to this rule was in the cases of nitrites and nitrates which were almost invariably present in greatest amounts between 6 p. m. and 5 a. m. The nitrites were present in greatetst amounts between 6 p. m. and 11 p. m., the maximum amount being found very uniformly at about 10 p. m. The nitrates were generally present in maximum amount at about midnight. As already explained, the presence in large quantities of nitrites and nitrates at these hours is due to the fact that the proportion of ground water to the sewage is much greater during the night.

The sewage appears to be very dilute between 1 and 6 o'clock a. m. During these hours it is scarcely more polluted than many brooks running through agricultural communities, although the presence of fairly large amounts of nitrates and chlorine show that the water in the sewers strongly resembles water which has at some time been polluted but by its passage through the ground has become to some extent purified; in other words, the water flowing at night has the appearance of being ground water from a thickly populated community.

Character of Sewage as Shown by Daily Analyses.

Analyses of station sewage were made daily from the 26th of May, 1908, to the 30th of June, 1909, inclusive. Only a few analyses were made in May, 1908, and on that account too much value should not be attached to the average results for that month.

The results of these analyses, given in detail in Appendix D, can, on account of the great mass of figures, be best studied from the averages given in Table XXVII. The individual analyses, however, show the wide fluctuations in the quality of sewage from day to day, and also the effect of storm water. An illustration of the wide fluctuation in results is shown by the analyses of July 18 and 19. Upon the former day the total suspended matter amounted to 898 parts, while upon the latter day it had dropped to 182 parts. This great fluctuation is explained by the facts that the 19th, upon which the sewage was comparatively weak, fell upon Sunday, and that there was considerable rain on the 18th.

The marked effect of storm water upon the composition of the sewage is clearly shown by the analyses of June 4 and 5, 1909. Upon the latter day rain was falling for practically 24 hours, and the flow increased from 2.1 million gallons on the former day to 2.8 gallons upon the latter day, an increase of about 31%. This storm water came from the roofs of houses connected with the sewers, from streets still connected to the sewer system, and from some of the mill tanks which are so located and constructed as to allow considerable water to flow from the surface of the ground into them. The water from these various sources, particularly from the street surfaces and from mill yards, carried with it comparatively large quantities of suspended mat-

ter which materially increased the amount of suspended matter in the sewage upon the 5th of June over that contained in the sewage upon the day previous. The increase in strength is shown by the following tabulation:

	June 4th.	June 5th.	Increase.
Total Suspended Solids..........	312	622	166%
Volatile " "	196	254	73%
Fixed " "	116	368	324%

While the amount of suspended matter in the sewage upon the rainy day was very much greater than upon the fair day, the difference in the analyses did not fairly represent the total increase in suspended matter delivered at the experiment station because there was, in addition to the increased strength of the sewage, an increased flow. The last column in the foregoing table takes into account the increase in flow as well as the increase in impurities, and shows that there was an increase of 166% in the amount of impurities delivered at the station during the 24 hours of the 5th of June, probably almost wholly due to the effect of the storm water. The impurities carried by the water running over the surface of the ground are very largely of a mineration nature, as is demonstrated by the analyses which show an increase in organic matter of 73%, while there was an increase in mineral matter of 324%. This single illustration of the effect of storm water upon the composition and flow of the sewage clearly shows the great importance of preventing the admission of storm water to the sewers, and gives an idea of the additional burden which will be placed upon the sewage disposal plant if storm water is allowed to enter.

While the effect of summer showers and many times of protracted rains during the spring, summer or autumn, will be to produce a sewage containing an unusually large amount of suspended matter, yet some storms and particularly the water from melting snow in the spring of the year will cause the sewage to be quite dilute. The accumulation of filth upon the surface of the streets and about various mill yards reaching the sewers with storm water, may cause an increased strength of sewage, even at times when the snow is melting, but in general the high flows of spring will be accompanied by dilute sewage. The effect of ground water will usually be to cause a dilute sewage and at seasons when large quantities of ground water find their way into the sewers, the sewage will generally be correspondingly dilute.

Table XXVII is a compilation of the monthly averages of all regular daily analyses of station sewage made during the period covered by the experiments and includes also the weighted average of the analyses. This table is therefore based upon about 400 separate analyses.

These analyses indicate that the character of the sewage on the average throughout the 24 hours of the day, and throughout the entire month, is similar to that of city sewage containing manufacturing waste, although it is very strong, containing an unusual amount of chlorine and is exceptionally alkaline in reaction.

In considering these analyses, it should be borne in mind that the mill tanks were almost all in operation during the period covered and that a very large proportion of the impurities which would otherwise have found their way into the sewage were retained in these tanks.

The effect of the mill settling tanks upon the composition of the sewage has been very pronounced. The character of the sewage has been greatly changed by the use of these tanks, without which it would have been extremely difficult and expensive to purify. About 50% of the nitrogenous matter and of the carbonaceous matter, as shown by organic nitrogen and oxygen consumed, is in suspension.

Of the suspended matter substantially 60% is organic. This proportion corresponds quite closely with that found in ordinary city sewage, especially with sewages containing more or less manufacturing wastes.

TABLE XXVII.

Results of Chemical Analyses of Station Sewage. Monthly Averages.

Parts per Million.

1908—Date	Temp. Deg. F.	Nitrogen: Organic: Total	Nitrogen: Organic: Dissolved	Nitrogen: Organic: Suspended	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Consumed Oxygen: Total	Consumed Oxygen: Dissolved	Consumed Oxygen: Suspended	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved	Carbonic Acid	Fats	Quantity of Sewage Received at Station. Million Gallons per Day.
May	54	13.0	7.1	5.9	9.7	0.47	0.55	53	27	26	80	121	71	50	179		2.0	22	3.121
June	53	22.0	9.6	12.4	12.0	0.34	0.77	81	34	47	112	404	242	162	208		−3.8	52	2.341
July	59	24.3	7.7	16.0	13.0	0.12	0.30	105	37	68	137	531	299	232	215		5.1	58	1.956
Aug.	63	20.0	7.0	13.0	11.7	0.23	0.52	90	35	55	112	447	280	167	196		−1.1	51	2.075
Sept.	62	21.0	11.0	10.0	12.0	0.22	0.56	108	56	52	134	352	216	136	219	0.88	−6.0	42	1.874
Oct.	57	23.0	11.0	12.0	12.0	0.26	0.60	110	54	56	128	384	229	155	215	2.20	−10.0	53	1.977
Nov.	52	23.0	11.0	12.0	14.0	0.31	0.62	100	47	53	141	392	225	167	290	1.42	−21.0	55	1.812
Dec.	49	20.7	12.0	8.7	13.0	0.29	0.93	87	46	41	165	304	201	103	208	1.40	−16.0	46	1.959
Jan.	47	24.0	15.0	9.0	12.0	0.33	1.13	99	53	46	171	350	213	137	212	2.40	−20.0	46	2.230
Feb.	46	24.0	14.0	10.0	11.0	0.44	1.00	110	50	60	170	470	265	205	219	2.60	−20.0	54	2.933
Mar.	45	19.4	13.5	5.9	11.0	0.52	1.30	82	43	39	126	269	160	109	211	3.60	−9.0	44	3.006
Apr.	46	20.0	12.0	8.0	8.8	0.75	1.66	85	40	45	116	392	194	198	200	3.30	−9.0	37	3.803
May	51	27.0	14.0	13.0	10.6	0.63	1.25	95	44	51	166	517	239	278	213	2.40	−11.7	32	2.656
June	57	31.0	16.0	15.0	13.0	0.47	0.58	98	46	52	188	536	257	279	231	2.00	−5.9	45	2.271
Average	53	23.0	12.0	11.0	12.0	0.38	0.87	95	45	50	158	406	229	176	217	2.32	−10.0	48	.....

It is important to note that during September, October and November, when the sewage contained only a moderate amount of storm or ground water, dissolved oxygen was present upon nearly all occasions. (Prior to September 21, the dissolved oxygen was not determined). The fact that dissolved oxygen, nitrites, and nitrates, are present so large a proportion of the time, is another indication that the sewage is rather more stable than ordinary city sewage. This is particularly significant in view of the fact that all of the mill wastes pass through tanks containing sludge before being discharged into the sewer. This sludge, as has already been pointed out, has undergone more or less decomposition, and unless the wastes were more stable in composition than ordinary domestic sewage, the dissolved oxygen would probably be entirely used up, not only in the mill wastes themselves, but also in the domestic sewage flowing in the trunk sewer.

Composition of Sewage Compared with that of Other Cities.

In Table XXVIII are given the average results of analyses of sewage from various cities and towns, by means of which it is possible to make a comparison of the quality of that received at the experiment station in Gloversville with that received at the experiment stations at Columbus, Ohio, Boston, Mass., and Waterbury, Conn., and also with that received at the sewage disposal plants at Worcester, Brockton, and fifteen other cities and towns in Massachusetts. From this table it appears that there is about twice as much nitrogenous organic matter in the sewage of Gloversville as in that of Columbus or Waterbury. It is also significant that while Free Ammonia in the sewage at Gloversville is as high as that of Columbus and Waterbury, it is much lower than that of Worcester, Brockton, or the average of all the other Massachusetts cities. This is doubtless due to the dilution of the domestic sewage with tannery wastes, which are low in Free Ammonia,—a condition previous pointed out.

TABLE XXVIII.

Average Results of Chemical Analyses of Sewage of Various Cities.

190—Date	Temp. Deg. F.	Parts per Million. Nitrogen, Organic, Total	Nitrogen, Organic, Dissolved	Nitrogen, Organic, Suspended	Nitrogen, Free Ammonia	Nitrogen, Nitrites	Nitrogen, Nitrates	Oxygen Consumed, Total	Oxygen Consumed, Dissolved	Oxygen Consumed, Suspended	Chlorine	Suspended Matter, Total	Suspended Matter, Volatile	Suspended Matter, Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved	Carbonic Acid	Fats
Average																		
Gloversville Sta.	53	23.0	12.0	11.0	12.0	0.38	0.88	95	45	50	158	406	229	177	233	2.32	-10.0	48
Columbus	..	9.0	3.3	5.7	11.0	0.09	0.20	51	26	25	65	209	79	130	...	....	27.0	25
Waterbury	58	14.8	10.3	4.5	7.8	0.14	1.52	46	26	20	48	165	115	50	41	3.80	18.0	26
Worcester, 1908	..	....	....	....	22.2	....	....	117	61	56	57	258	166	92	...	....	.....	..
Brockton, 1903	..	....	....	....	53.2	....	....	218	93	125	133	579	504	75	...	....	.....	..
Ave. for fifteen other Mass. cities, 1903	..	....	....	....	24.1	....	....	47	27	20	42	148	118	30	...	....	.....	..
Boston, 1903-1905	..	....	....	....	18.5	0.19	0.10	43	24	19	...	...	...	...	...	2.00	.....	..

The quantity of carbonaceous organic matter as represented by Oxygen Consumed, is about twice as great in the sewage at Gloversville, as in that of Columbus, Waterbury, or the fifteen cities and towns of Massachusetts, although somewhat less than that of the City of Worcester, and considerably less than that of the city of Brockton. The Total Suspended Matter found at Gloversville is twice as high as that of Columbus, Waterbury, or the fifteen cities in Massachusetts, although not as great as that of the City of Brockton. In this connection it should be stated that the sewage of the City of Brockton is one of the strongest sewages, analyses of which are available for comparison. In general it may be stated that the sewage of Gloversville, even when the mill settling tanks are in operation, is fully twice as strong as that which has been experimented with at the various experiment stations, and with the exception of Brockton, fully twice as strong as that which is actually treated at a large number of sewage disposal works in Massachusetts.

Character of Sewage received between 7:00 a. m. and 6:00 p. m.

While there are small quantities of mill wastes discharged throughout the night, the marked effect of the tannery waste becomes apparent soon after 7 o'clock in the morning, and continues until 9 or 10 o'clock in the evening, although there is a gradual reduction in the amount after 6 o'clock.

Some light is thrown on the effect of mill wastes upon the character of the sewage by the analyses recorded in Table XXIX. Unfortunately the analyses for the 24-hour and the 10-hour periods were not made upon samples taken upon the same days, although the general conditions were the same during both periods, and they are sufficiently close together in point of time, so that they probably fairly closely represented the character of the sewage received during the latter part of 1907 and the early part of 1908. From these analyses, it appears that the station sewage throughout the twenty-four hours contains only about 63% as much Organic Nitrogen as during the 10-hour period of the working day. A similar comparison shows only 63% as much Suspended Matter during the 24-hour period as during the 10-hour period.

TABLE XXIX.

Average Analyses of Station Sewage Received During Entire Day and 10 Hour Day.

	Parts per Million.																
	Nitrogen						Oxygen Consumed				Suspended Matter						
	Organic																
190—Date	Total	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Chlorine	Total	Volatile	Fixed	Alkalinity in Terms of Ca Co 3	Carbonic Acid	Fats	REMARKS.
Nov. 1907	17	8.3	8.7	11	0.35	1.10	75	37	38	173	209	148	61	233	-6.8	39	Week days only 24 hr. day. 7 A. M.-7 A. M.
Dec.-Jan. '07-'08	27	15	12	11	0.36	0.85	103	53	50	225	330	201	129	211	-20	66	Week days only 10 hr. day. 7 A. M.-5 P. M. Dec.11, '07, to Jan. 31, '08.
	Ratio in per cent. of 24 hour analyses to 10 hour analyses.																
	63	56	72	100	97	130	73	70	76	77	63	74	47	110	34	59	

Effect of Incubating Samples of Station Sewage.

One of the difficulties in the way of satisfactory treatment of the Gloversville sewage, and one which has always been borne in mind, is that caused by the presence of chemicals in the mill wastes, and the general antiseptic character and stability of these wastes. To throw some light in a general way upon the degree of putrescibility, or in other words, the rapidity with which the sewage would undergo decomposition, a series of tests was made to determine the change in chemical composition caused by submitting samples to a period of incubation. The samples collected were held in glass bottles at room temperature, averaging perhaps 70°F, during periods varying from 6 to 12 days.

All of the samples were composed of portions taken every fifteen minutes from 7:15 a. m. to 6:45 p. m. and were colored with mill wastes and the color persisted in all throughout the experiment, except those which were highly putrescible, which turned black. The results of the analyses made before and after incubation, together with the percent of increase or decrease in the various determinations, are given in Table XXX. From these analyses it appears that the change due to bacterial action is material but does not appear to be much greater in 12 days than in 6 days. The decrease in amount of organic nitrogen varied from 16 to 52% during the period of incubation, and there was a corresponding increase in Free Ammonia of from 7 to 150%. The putrefactive processes were sufficient in almost all cases to eliminate the nitrites, and in all cases the nitrates. There was a material transformation in the carbonaceous organic matter as indicated by Oxygen Consumed, which decreased in the incubated sample by from 18 to 37%.

TABLE XXX.

Chemical Analyses of Sewage Showing Effect of Incubation at Room Temperature.

(Composite Samples covering Working Day.)

Number of days samples were incubated.	Parts per Million.																							
	Nitrogen as												Oxygen Consumed			Suspended Matter								
	Organic			Free Amm.			Nitrites			Nitrates						Total			Volatile			Fixed		
	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Increase	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Decrease	before Incu.	after Incu.	% Decrease
9	21	12	43	1.2	18	50	.22	.00	100	1.90	.00	100	111	70	37	350	300	14	190	159	16	160	141	12
8	25	17	32	1.0	17	70	.14	.00	100	2.30	.00	100	154	126	18	512	470	8	266	308	−16	246	162	34
8	20	13	35	9.5	17	79	.22	.07	68	1.60	.00	100	105	78	26	452	356	21	218	195	11	234	161	31
7	32	27	16	8.3	8.9	7	.08	.00	100	2.30	.00	100	147	102	31	610	518	15	276	194	30	334	324	3
11	30	16	47	9.3	23	147	.18	.00	100	2.10	.00	100	118	83	30	404	356	12	222	196	12	182	160	12
10	27	13	52	1.0	24	140	.80	.01	99	0.28	.00	100	108	89	18	386	308	20	212	169	20	174	139	20
8	34	22	35	9.9	21	112	.16	.00	100	1.50	.00	100	128	99	23	446	385	14	252	237	6	194	148	24
7	31	20	29	8.9	21	136	.16	.00	100	0.70	.00	100	125	99	21	368	356	3	248	178	28	120	178	−48
6	42	23	45	8.0	20	150	.16	.00	100	1.20	.00	100	129	102	21	444	402	9	232	220	5	212	182	14
12	33	21	36	8.3	16	93	.12	.00	100	3.00	.00	100	162	129	20	474	456	4	238	214	10	236	242	−3

The samples incubated were those collected from 7:15 A. M. to 6:45 P. M.

From these tests made upon different samples, only the most general conclusions can be drawn. To carry this study further, a series of tests was made upon a single sample of sewage, which was incubated for a period of six days. This contained about the usual proportion of mill waste found in the sewage flowing in the daytime, and was also incubated at room temperature, nominally 70°F, analyses being made every 24 hours during the period of incubation, which are recorded in Table XXXI. The gradual and nearly uniform decrease in the amount of organic nitrogen is significant, and is accompanied by a corresponding increase in the amount of Free Ammonia.

At the time it was taken the sample contained a small amount of nitrates and nitrites, which entirely disappeared at the end of the second day. The total Oxygen Consumed showed a gradual reduction from 107 to 77 parts, while the reduction in the amount of Dissolved Oxygen Consumed was very marked, amounting to slightly more than 50%.

The residue on evaporation fluctuated considerably, and a small reduction in the total amount was indicated by analyses. It is entirely possible that there was a slight reduction in the amount of organic solid matter, due to transformation from the solid to the gaseous state. This reduction, however, would doubtless be very small, especially in so short a time and under conditions which do not insure early pronounced putrefactive action. The slight reduction in the amount of fixed or mineral solid matter, is not easily explained. It is quite possible that this may have resulted from the incrustation of the bottle with salts of lime, so that the samples taken from time to time did not contain as much lime as the original sample. The reduction, however, was comparatively slight, although the fluctuations were large.

TABLE XXXI.

Chemical Results showing effect of Incubating a Sample of Sewage at room temperature for 7 days with analyses every 24 hours.

Number of hours incubated.	Nitrogen as						Oxygen Consumed				Suspended Matter			Residue on Evaporation								
														Total			Volatile			Fixed		
	Total Organic	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Alkalinity	Total	Volatile	Fixed	Total	Dissolved	Suspended	Total	Dissolved	Suspended	Total	Dissolved	Suspended
Initial.	29	15	14.0	11	0.16	1.20	107	59	48	240	328	208	120	1255	944	311	247	129	118	1008	815	193
24	22	11	11.0	15	0.04	0.11	99	47	52	240	406	266	140	1213	903	310	255	106	149	958	797	161
48	18	6.3	11.7	19	0.0.	0.00	90	38	52	240	308	206	102	1157	879	278	227	75	152	930	804	126
72	14	4.3	9.7	25	0.0.	0.00	86	44	42	240	356	230	126	1173	887	286	280	100	180	893	787	106
96	14	4.3	9.7	25	0.0.	0.00	93	34	59	270	354	222	132	1122	856	266	206	45	161	910	811	105
120	15	4.1	10.9	24	0.0.	0.00	85	30	55	290	286	182	104	1131	860	271	155	49	106	970	811	165
144	13	...	....	24	0.0.	0.00	77	27	55	290	282	186	96	....	...	...	...	...	...	....	...	...

As a result of the various incubation tests, it appears that the sewage containing the mill wastes,—or in other words, that received at the station between the hours of 7 a. m. and 6 p. m., is amenable to the usual laws of putrefaction and decomposition. Further light will be given upon this subject by bacterial tests and also by the results of the operation, for a period of several months, of the septic tank. The indications of these tests, which were made prior to installation of the septic tank, were sufficiently encouraging to warrant the construction of the experimental tanks, and the further investigation of the biological treatment of this sewage.

EXPERIMENTS WITH SCREENING.

All the sewage pumped to the various tanks was passed through a wooden screen built as already described. No measurements of the amounts of screenings removed from day to day from this portions of the sewage have been made as such figures would have been unreliable on account of the position of the screen in the trunk sewer, as the major portion of the flow passed around the screen on its way to the creek.

To determine the probable effect of screening upon a large scale the entire flow of sewage was passed through a wooden screen made like the one permanently used in front of the pump. This experiment was continued throughout the twenty-four hours for six consecutive days. The data obtained are given in Table XXXII.

TABLE XXXII.

Data Relating to Screening Sewage.

Date and Day of the week.	Lbs. Screenings removed per day.	Lbs. Screenings removed per mil. gals.	Weather Conditions.	Total flow of Sewage Gals. per 24 hours.
April 8, 1908 Wednesday	237	41.6	Raining at 8 a. m. 12 m. 5 p. m.	5,708,000
April 9, 1908 Thursday	95	17.6	Clear	5,439,000
April 10, 1908 Friday	95	22.6	Clear	4,182,000
April 11, 1908 Saturday	119	29.0	Rain at 8 a. m.	4,140,000
April 12, 1908 Sunday	71	19.7	Clear	3,599,000
April 13, 1908 Monday	166	47.7	Rain at 8 a. m.	3,478,000

The sewage carried very large quantities of hair, skin, paper and rags which tended to seriously and quickly clog the screens, so that it was neces-

sary to keep a man at the experimental screen practically all of the time between the hours of 7 a. m. and 12 m. During the afternoon the screen required cleaning several times but during the night it was not found necessary to clean it at all. In this connection it should be remembered that the sewage is received in a very fresh condition and that little opportunity is afforded for the mechanical or chemical disintegration of the large solid matters, which is so effective in many other cities where the conditions are very different.

An average of about 30 pounds of screenings were removed from each million gallons of sewage screened. The screenings were sampled each day and found to consist of 17% dry solid matter and 83% water. The dry solids contained 79% volatile or organic matter and 21% of mineral or inorganic matter.

Conclusions from Tests.

It is apparent from the tests which have been made that if screens are to be used they will require the services of an attendant during the greater part of the working day or the work must be done by automatic mechanical devices. In view of the fact that any preliminary process which may be adopted will involve the use of tanks it is believed that thorough screening is not only unnecessary but should be avoided as involving additional and useless expense, only such screening being done as may be necessary to protect valves and machinery. The quantity of screenings removed from the sewage would have no material effect upon the quantity of sludge or the expense of dealing with it.

RESULTS OF EXPERIMENTS WITH GRIT CHAMBER.

The usual object of constructing Grit Chambers in connection with sewage disposal plants is to collect the coarse and heavy particles carried by the sewage which would otherwise be carried into septic tanks or sedimentation basins. Such substances find their way into systems of combined sewers during storms and are largely of a mineral nature. Where, as in the case of Gloversville, separate drains are provided for storm water, very little if any road detritus finds its way into the sewers. On the other hand, much of the refuse from the tanneries is of a very heavy nature and the large quantities of lime if discharged into the trunk sewer might form deposits in septic tanks or sedimentation basins which could be removed from Grit Chambers more economically. It was to determine the necessity for such chambers that the experimental grit chamber was provided.

A Grit Chamber was accordingly built as already described in detail, and was operated from May 26, 1908, until the end of the following July. The results of daily analyses of sewage leaving the grit chamber are recorded in Appendix E.

The amount of suspended matter removed by the grit chamber as originally constructed was very large and consequently the amount of material subject to bacterial action which entered the septic tank was much less than if the sewage did not first pass through this chamber. For these reasons the chamber was modified about August 1st, since which time analyses of the effluent have been discontinued. The amount of sludge collected by and removed from the remodelled Grit Chamber, has been measured and weighed

but the quantity was so very small in relation to the flow that the effect upon the analyses was immaterial and therefore the quantities are not given.

The quantities of suspended matter removed from the sewage during its passage through the chamber as originally constructed, amounted to 43.6% and 35.6% during June and July respectively.

Various data relating to the operation of the Grit Chamber and classified according to the periods of operation between cleanings, are presented in the following table:

TABLE XXXIII.

Data Relating to Operation of Grit Chamber.

1908.	May 25th.	June 20th.	July 12th.	July 31st.
Days in period................	32	26	22	19
Days since tank was cleaned...	32	26	22	19
Total quantity of Sewage flowing through Chamber*........	3200,000	2,600,000	2,200,000	1,900,000
Average period of flow (hours).	0.36	0.36	0.36	0.36
Average velocity M.M per sec...	1.9	1.9	1.9	1.9
Cu. Yds. of Sludge per mil. gals.	1.1	2.1	2.4	2.8

*Since last cleaning.

From the investigation made it appears that from 1.1 cubic yards to 2.8 cubic yards of sludge were produced by and removed from the grit chamber during each of the several periods of its operation. It was found necessary to remove the sludge from the chamber at least once in each month.

The sludge removed was exceedingly offensive and of a character represented by the following analysis:

TABLE XXXIV.

Analysis of Sludge Removed from Grit Chamber.

Specific Gracity	1.023	
Tone of Sludge per mil. gals.........................	0.94	
Water	92%	
Solids	8%	
Volatile Matter	51%	Calculated in
Nitrogen	2.5%	Dried
Flats	2.6%	Sample.

The sludge did not appear to differ materially from that collected in the septic and sedimentation tanks. There was not a large excess of sand, lime or other mineral matters.

Conclusions as to Its Usefulness.

The effect of a grit chamber in withholding a large proportion of the suspended matters of the sewage from the septic tank is to greatly reduce the material available for bacterial action and consequently to reduce the amount of such action and the amount of benefit derived therefrom should such action and the amount of benefit derived therefrom should such action be beneficial. Undoubtedly among the matters retained in the grit chamber is a large proportion of those which are most likely to assist in the formation of scum.

The grit chamber may be beneficial in withholding such matters provided a scum is undesirable and on the other hand if it is advisable to form a scum on the surface of the water, the action of the grit chamber is likely to be detrimental.

Where sedimentation is the preparatory method of treatment there seems to be little reason for removing a large proportion of the sludge by means of a grit chamber when the sludge which accumulates in such a chamber is of a character nearly identical with that found in the sedimentation basin.

Experience with the experimental chamber indicates that during the periods of its operation in its original form the sludge at the time of removal was exceedingly offensive. This fact has also been demonstrated on a large scale by grit chambers at other places, notably those connected with the disposal plant of the City of Worcester, Mass.

If the velocity of flow through the chambers is increased, as was done by remodeling the experimental plant, so as to prevent the sedimentation of the organic matters and retain simply the very coarse particles and heavy mineral matters, the amount of material removed from the sewage of Gloversville will be very small. The amount of such material removed from the chamber after the alterations were made was approximately 0.6 of a cubic foot per million gallons of sewage passing through the chamber. It is apparent that this quantity is insignificant and if not retained in a grit chamber, would not in any way interfere with the successful action and operation either of septic tanks or of sedimentation basins. The material which was deposited in the remodelled chamber was not of a particularly offensive nature and no difficulty would be anticipated in disposing of it on a large scale if for any reason a grit chamber should be found to be a desirable feature of the proposed plant.

These experiments have proven that the construction of grit chambers as a feature of the proposed sewage disposal works, is unnecessary providing that suitable settling tanks are constructed and efficiently maintained at the various tanneries and mills producing wastes containing suspended matter. If such tanks cannot be efficiently maintained, grit chambers would very likely be of material advantage in the operation of the plant. The results of this part of the investigation are particularly interesting as demonstrating that a certain portion of the sewage disposal plant which might otherwise have been built, can be omitted.

EXPERIMENTS WITH SEPTIC TREATMENT.

Preliminary tests of the susceptibility of this sewage to bacterial action, were made as already described, by incubating certain samples of sewage for varying periods of time. These tests indicated that under suitable conditions the chemical character of the sewage underwent considerable change due to growth and life processes of bacteria.

Such bacteriological tests as have been made have confirmed the conclusions drawn from the preliminary incubation tests and chemical analyses and indicate that the changes which the sewage will undergo in the septic tank, are in a general way similar in nature to those which are generally found to take place when domestic or city sewage of ordinary quality is passed through such tanks, The septic tank was put into use on April 27, 1908, and has been operated almost continuously from that time until July 6, 1909.

Period of Operation and Rate of Flow.

The time during which this tank has been in operation may logically be divided into five periods. The limits of these periods, the number of days ncluded in each, the rate of flow in hours, and the calculated velocity of flow, are given in the following table:

TABLE XXXV.

Periods of Operation of and Rates of Flow Through Septic Tank.

Period in Operation	Duration in days.	Period of flow (hours)	Av. velocity of flow (m.m. per sec. based upon full cross section of tank.)
April 27-Aug. 26, 1908	121	16	0.17
Aug. 26-Dec. 3, 1908	75	8	.0.34
Dec. 3, 1908-Jan. 9, 1909	34	8	.0.34
Jan. 9-May 5, 1909	117	6 (6 a. m.-6 p. m.)	0.45
		10 (6 p. m.-6 a. m.)	0.27
May 5-		6 (6 a. m.-6 p. m.)	0.45
July 6, 1909		10 (6 p. m.-6 a. m.)	0.27

The tank was operated upon a 16-hour flow basis from April 27 to August 26. There were indications during this period that the fermentation in the tank was not as active as was desirable, and in part for that reason, and in part to determine the effect of reducing the length of the period, it was transferred to an 8-hour basis on August 26, and continued to operate at this rate to December 3, 1908, the end of the second period. The flow through the tank was interrupted for 3⅛ days during the first period, at the time when the alterations were being made in the grit chamber.

During May, June, and July, the sewage was passed through the grit chamber as originally constructed, prior to entering the septic tank. As already explained in detail under the caption, "Results of Experiments with Grit Chamber," much of the heavier suspended matter was removed from the sewage while passing through the grit chamber, and consequently did not find its way into the septic tank and did not go to make up a portion either of the scum or sludge.

At the end of the second period the sludge was removed from the tank. thus logically terminiating the period. The third period extended to January 9th, when the rate of flow through the tank was so altered as to make it as nearly as practicable proportional to the rate of flow in the intercepting sewer. To accomplish this, the rate was increased to a six-hour period during the twelve hours from 6 a. m. and the night rate was reduced to a ten-hour period.

The fourth period extended from the time of making the rate of flow proportional to that of the sewage delivered at the station to May 5, when the tank was again cleaned.

The fifth period extended to July 6, the rate of flow being the same as during the preceding period.

General Observations.

The tank was started at a season of the year when it should have matured rapidly with the advent of warmer weather. However, up to August 26 there was very little septic action apparent; gas was given off only in very small quantities, the sewage retained its original color and little scum was formed. The scum that was formed was that of a finely divided nature and consisted of a thin film on the surface of the water. There were very few of the violent ebulitions of sludge due to the storage of gas which are so characteristic of septic tanks under active fermentation. Much of the time there was a growth of green algae on the surface of the sewage, indicating the presence of dissolved oxygen, nitrites or nitrates, which indications were confirmed by the analyses.

It was thought that possibly the lack of active fermentation was due to the fact that large quantities of sludge were retained in the grit chamber, and consequently on August 6, the chamber was reduced in size so that practically all of the suspended matter of the sewage was forced along with it into the septic tank. After August 26 the increased rate of flow through the septic tank to an 8-hour period provided a larger quantity of sludge to serve as a medium for the propagation and growth of bacteria.

Either these changes, higher temperature, or other favorable conditions which were not recognized, caused a decided increase in the amount of fermentation. Gas was given off in comparatively large quantities and violent upheavals of sludge saturated with gas were of frequent occurrence. There was a marked increase in the quantity of suspended matter escaping with the effluent due to nearly constant agitation of the sewage and sludge in the tank by rising gas bubbles. Small patches of scum were found floating on the surface of the sewage of the first compartment of the tank. The maximum dept of the scum was about five inches and there was not nearly as much as would be expected from the active fermentation of so fresh a sewage.

With the advent of lower temperatures in November there was a noticeable reduction in the activity of fermentation and on November 23 the last of the heavy or thick scum settled to the bottom of the tank. Dissolved oxygen returned to the effluent early in November when its temperature dropped to 51° or 52° Fahrenheit and increased gradually until early in December when two to four parts were generally present.

The third period was begun with a clean tank on December 3, and continued until the rate of flow was changed to correspond more nearly with the rate of flow of sewage in the trunk sewer. In this way, an effort was made to operate the tank under conditions as nearly as possible like those which will exist when the proposed plant is built. The change in rate, however, did not cause any apparent increase in the amount of fermentation in the tank and it again became necessary to remove the sludge, which was done May 5, 1909.

The tank was put into use immediately upon being cleaned, thus beginning the fifth period of service. The rates of flow were continued the same as during the fourth period, that is, sufficient to fill the tank in six hours during the day and in ten hours during the night. During this period the sludge accumulated rapidly but up to July 6 there had been no apparent increase in the amount of fermentation and as far as outward appearances

went the tank was doing practically the same work as the sedimentation tank. The chemical analyses, however, indicate that septic action was being gradually established.

Evolution of Gas.

While small quantities of gas have been given off from the tank much of the time and fairly large amounts during the latter part of the summer and fall of 1908, yet the production of gas has appeared to be less than is ordinarily the case with septic tanks dealing with domestic sewage. No measurement of the quantity of gas produced nor analyses to show its quality have been made.

Coloring Matter Reduced.

During much of the daytime the station sewage was highly colored by the refuse tanning solutions. This color was somewhat reduced during the passage of the sewage through the septic tank. The reduction, however, was not much more marked than in the sedimentation tank.

Quality of Effluent.

Daily analyses have been made of the effluents from the septic tank from which it is possible to follow the action of the tank from day to day. The results of these analyses appear in Appendix F. In Table XXXVI are given the monthly averages of these analyses together with the weighted average for the entire time during which the septic tank has been in operation. The following tabulation shows the average composition of the crude sewage and the effluent from the septic tank, together with the percent increase or decrease in the several constituents:

TABLE XXXVI.

Monthly Averages of Chemical Analyses of Effluent from Septic Tank.

1908-09 Date	Temp. Deg. F.	Parts per Million: Nitrogen, Organic, Total	Nitrogen, Organic, Dissolved	Nitrogen, Organic, Suspended	Nitrogen, Free Ammonia	Nitrogen, Nitrites	Nitrogen, Nitrates	Oxygen Consumed, Total	Oxygen Consumed, Dissolved	Oxygen Consumed, Suspended	Chlorine	Suspended Matter, Total	Suspended Matter, Volatile	Suspended Matter, Fixed	Alkalinity in Terms of Ca Co 3	Oxqgen Dissolved
May......	..	7.7	4.9	2.8	11.0	0.06	0.13	38	23	15	76	69	48	21	193	....
June.....	..	10.0	5.7	4.3	14.0	0.09	0.13	39	27	12	105	67	51	16	208	0.1
July......	..	11.0	6.3	4.7	15.0	0.01	0.14	54	32	22	137	87	63	24	217	.15
August...	..	11.0	6.2	4.8	16.0	.026	0.18	52	32	21	119	115	78	39	227	....
September	..	11.6	...	...	16.0	0.13	0.09	67	..	..	123	111	79	32	247	....
October...	56	13.0	...	...	15.0	0.22	0.16	71	..	..	124	143	94	49	242	0.0
November	51	14.0	...	...	15.5	0.32	0.41	65	..	..	134	122	86	36	306	.71
December.	48	13.5	...	...	13.7	0.43	0.65	54	..	..	151	76	61	15	200	3.0
January..	46	16.0	...	...	12.0	0.41	0.98	66	..	..	165	87	66	21	206	3.2
February.	45	16.5	...	...	10.0	0.39	1.56	65	..	..	167	88	68	20	202	3.3
March....	44	15.0	...	...	10.6	0.49	1.70	56	..	..	130	89	66	23	197	4.2
April.....	45	13.5	...	...	9.70	0.84	1.60	50	..	..	117	86	60	26	200	4.3
May......	52	18.0	...	...	11.0	0.73	1.33	55	..	..	161	112	73	39	215	2.5
June......	58	17.0	...	...	17.0	0.24	0.45	57	..	..	193	107	79	28	234	.7
Average	50	13.3	6.0	4.5	14.0	0.29	0.59	58	30	18	136	100	71	29	221	1.8

Parts per Million	Sewage.	Septic Effluent.	Percent Removed.
Total Organic Nitrogen	23	13	43.5
Nitrogen as Free Ammonia	12	14	−16.7
Nitrogen as Nitrites	0.38	0.29	23.7
Nitrogen as Nitrates	0.87	0.59	32.2
Total Oxygen Consumed.............	95	58	39.0
Chlorine	158	136	13.9
Total Suspended Matter.............	406	100	75.0
Volatile " "	229	71	69.0
Fixed " "	177	29	83.5
Alkalinity	217	221	−1.8
Dissolved Oxygen	2.32	1.8	22.4

It will be noticed from the table of monthly averages of analyses that the average temperature of the effluent from the tank gradually dropped from 56° Fahr. in October to 44° F. in March, increasing to 58° for the month of June. Undoubtedly the low temperatures of the winter had a decided retarding effect upon fermentation in the tank. The effect of the cold weather, together with the sterilizing action of the chemicals from the mills, caused bacterial activity to be reduced to such an extent that the work of the septic tank compared closely with that accomplished by plain sedimentation.

The loss of heat in passing through the septic tank was very slight, averaging about one degree during the winter months.

TABLE XXXVII.

Temperature of Sewage and Septic Effluent.

(Degrees Fahrenheit) Month.	Sewage.	Septic Effluent.
November	52	51
December	49	48
January	47	46
February	46	45
March	45	44

The most noteworthy result of passing the sewage through the septic tank was the reduction of the amount of impurities due essentially to sedimentation. The total organic nitrogen was reduced on the average over 43%.

The quantity of Free Ammonia in the effluent was generally slightly greater than in the crude sewage, the increase on an average being 16.7 percent. This increase, although small, was clearly indicative of septic action, and it therefore appears that during practically no portion of the time has the tank been entirely free from such action. It is important to note that when there was marked septic action, as during the months of September and October. there was a much greater increase in the quantity of Free Ammonia. the average increase for the month of September being 33⅓%.

Nitrites and Nitrates have been present in the effluent throughout the experiments indicating that there has not been sufficient septic action to use up the oxygen combined in this form. When septic action was most marked the quantity of Nitrites and Nitrates was only slight, but they increased with the advent of colder weather so that during the winter months they were present in comparatively large quantities.

The determination of Oxygen Consumed shows a reduction in the amount of carbonaceous matter present in the sewage. The reduction was not as

great as in the case of the nitrogenous substances, being only 39% as compared with 43.5%.

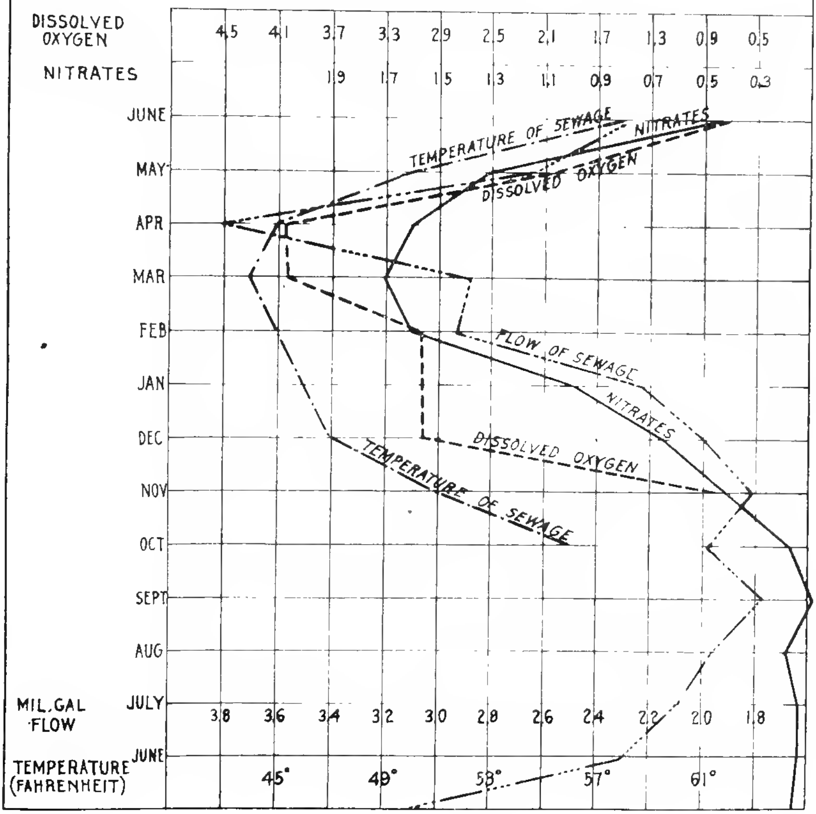
Of the suspended matters in the sewage 69% of those of organic nature and 83.5% of those of an inorganic nature were retained in the tank. With the increase in the amount of septic action, beginning in August, 1908, there was a marked increase in the amount of suspended matter in the effluent. This was due to the action of the gas bubbles in stirring up the sludge and sewage. The finely divided sludge thus distributed through the sewage was carried out of the tank with the effluent and into the filters. An effort was made early in December by remodeling the tank to prevent so large an amount of suspended matter from escaping. Unfortunately it was necessary to clean the tank before the alterations could be made, and consequently the cause of the greatly increased efficiency of the tank in this respect could not be definitely ascertained. It is quite probable, however, that the modification of the tank did little good because of the lack of active fermentation making unnecessary the precautions taken to prevent the escape of suspended matter. This conclusion is borne out by the fact that the amount of suspended matter in the effluent from the sedimentation tank, upon which no alterations were made, was practically the same during the winter as was that in the effluent from the septic tank.

The results of the experiments indicate that with tanks designed to reduce the amount of suspended matter in the effluent as much as possible, and with these tanks operated in the most careful and scientific manner, it would be impossible to produce an effluent containing on the average at most 90 parts per million of suspended solids. It may be possible that under the most favorable conditions the suspended solids might even be reduced to 80 parts per million. It is, however, very doubtful if such satisfactory results can be obtained from large tanks operated under ordinary conditions. Comparing these figures with the results obtained with experimental tanks at Lawrence, Mass., and Columbus, Ohio, and with the large tanks at Worcester, Mass., it appears that it will be very difficult to reduce the suspended matter in the sewage at Gloversville by septic treatment to a point as low as that in the effluents at Lawrence or Columbus (with the exception of Tanks D and E at the latter place). On the other hand, it would appear probable that with large tanks the suspended matter may be reduced somewhat lower than was found to be the case with the large tanks at Worcester.

The following figures, with those in Table XXXVI, make possible this interesting comparison:

	Parts per Million. Susp. Matter; Dry Solids.
Worcester, Mass.	
Average of two experiments.......	201
Lawrence, Mass.	
1898-1904, Tank A	81
1904-1906, " A	54
" G	70
" H	43
Columbus, Ohio,	
Tank A	73
" B	72
" C	81
" D	121
" E	130
Gloversville, N. Y....................	100

INCREASE IN QUANTITY OF DISSOLVED OXYGEN AND NITRATES IN EFFLUENT FROM SEPTIC TANK, CORRESPONDING TO REDUCTION IN TEMPERATURE AND INCREASE IN QUANTITY OF SEWAGE.



The effect of septic action was to increase the alkalinity of the sewage which was evident during each month from May until December, with the exception of June. During the four winter months December to March inclusive, when there was very little septic action, there was a slight reduction in alkalinity, while for the month of April it was the same in the effluent and sewage, and during the months of May and June there was again an increase. The average for the entire year was 5.5% higher in the septic effluent than in the sewage while during August there was an increase of 36.2%. The increase or decrease in alkalinity appeared to correspond in general with the intensity of septic action.

The dissolved oxygen which was almost universally present in the sewage, disappeared entirely during its passage through the tank when there was active fermentation. There was, however, a marked increase in the amount present in the effluent over that present in the sewage during the latter part of the fall and the amount remained comparatively uniform at from 3 to 4 parts during the winter. During June, 1909, the tank treatment effected a marked decreased indicating that septic action was again increasing, although yet feeble.

The effect of temperature in retaring the bacterial activity as shown by the chemical analyses, is illustrated by the different curves of Diagram 10. While the increase in dissolved axygen and nitrates corresponds closely with the reduction in temperature of the sewage, it is important to note that it corresponds also with the increase in the quantity of sewage, which increase is due to the discharge of surface and ground water into sewers.

The analyses which covered the period of thirteen months indicate that bacterial action is always going on in the septic tank but that such action is at no time as vigorous as is found under similar conditions with domestic sewage. The increase in free ammonia and the decrease in nitrites, nitrates, and dissolved oxygen all follow in fairly close manner the action going on in the tank as indicated by the formation of gas, scum, etc. While the cleaning of the tank in December was unfortunate, it is believed that the results of the winter's work have not been materially different from the results which would have been obtained had the sludge not been removed from the tank. There was almost a negligible change in the quality of the sewage due to bacterial action during the winter and early spring. In the month of June, 1909, however, there was a marked change in the amount of dissolved oxygen in the effluent and after the 22d, it was found to be entirely exhausted, although always present in the crude sewage, at the same time there was a marked increase in the amount of free ammonia. The indications are, therefore, that septic action will become vigorous during the summer and fall of the present year as it did during the summer and fall of 1908.

Sludge Retained by Septic Tank.

The removal of suspended matter from the sewage by sedimentation being an important function of the septic tank, it naturally follows that the study of the suspended matters thus removed and accumulated in the tank, is of much importance. It was believed when these experiments were begun that a large amount of sludge would be produced, which prophecy has been fulfilled. The sludge showed from time to time the effects of septic action. The evidence of such action was naturally much greater during that portion of the time when fermentation was most active. At such times there was a tendency for the sludge to become distributed over the bottom of the tnak

in a layer of fairly uniform thickness throughout its length. At times when there was little septic action there was a decided accumulation at or near the inlet end of the tank, with a corresponding reduction in depth toward the outlet end. There was never sufficient septic action to cause the sludge to become generally disintegrated and finely divided. Coarser particles and fibrous matter were always in evidence in the first and second compartments, although in the third and fourth compartments, especially during the period of active fermentation, the sludge was more finely divided and showed marked evidence of disintegration due to septic action.

The sludge always had an offensive odor although the characteristic odors of the tannery refuse were never entirely obliterated.

The coarser and more fibrous sludge which was retained in the first and second compartments was usually of a grayish color, while the more finely divided sludge from the third and fourth compartments was generally black.

The consistency of the sludge in the first and second compartments was such that it could not be readily pumped without the addition of considerable water. After draining for a short time it was of such a nature that it could be forked or shoveled. The sludge from the third and fourth compartments was of such a consistancy that it could generally be pumped without great difficulty. It is quite probable that the difference in the physical condition of the suspended matter in the sludge was partly responsible for the apparent difference in its consistency. In other words the coarse and fibrous material collected in the first and second compartments doubtless offered greater resistance to pumping than the more finely divided materials in the other compartments. The proportion of solid matter in the sludge, as will be seen from the further discussion of this subject, was usually noticeably greater in the first compartment than in the others.

The results of the various measurements and analysis of the sludge are given in Table XXXVIII.

Volume of Sludge Produced from Month to Month.

The volume of sludge produced during the different months of operation varied from 4.1 cubic yards per million gallons of sewage passing through the tank to 7.3 cubic yards.

The relative quantity of sludge produced during the period of active fermentation was less than that produced earlier in the life of the tank or during the winter and spring of 1909 when very little septic action was evident. It is true that a part of the suspended matter of the sewage escaped with the effluent during the period of greatest activity and that in part accounts for the reduced volume of sludge formed during that time. It is doubtless also true that a part of the reduction was due to fermentation. It is interesting to note that the minimum production of sludge was at the rate of 4.1 cubic yards per million gallons, while the maximum rate of production during the winter was 6.1 and from June 12 to July 6, 1909, it was 7.3 cubic yards. The sludge produced during this last period was, however, comparatively light. In other words, nearly twice as great a volume of sludge was produced during the early summer of 1909 as during September and November when the fermentation was at its maximum.

Density of Sludge.

At the various times when the sludge was examined it was found to vary in density from 82% water on June 3, and 12, 1909, to 93% water on

August 26, 1908. The sludge produced during the spring of 1909 was very heavy, the maximum weight per cubic yard being 1898 pounds, while the minimum weight, found on August 26, was 1721 pounds per cubic yard. The specific gravity of the sludge varied from 1.02 to 1.13.

Volume and Analyses of Sludge Removed from Tank.

While the monthly measurements of sludge throw much light upon the rate of accumulation and the variations from month to month, it is important

TABLE XXXVIII.

Data Relating to Sludge Collected in Septic Tank April 27, 1908-July 6, 1909.

Results of Analyses given in Percent. by Weight of Wet Sludge.

	Dates of Measuring and Sampling.											
	Aug. 26	Sept. 11	Nov. 9	**Dec. 3	Jan. 9	Feb. 2	Mar. 2	Apr. 3	May 3	June 3	**June12	July 6
Days in Period	121	16	59	24	34	24	28	32	32	29	9	17
Days since tank was cleaned	121	137	196	220	37	61	89	121	153	182	191	24
Total mil. gals. treated	2.78	0.75	2.78	1.13	1.60	1.20	1.41	1.61	1.61	1.45	0.45	0.84
						6.00 hrs.						
						6 a. m.-6 p. m.						
Av. period of flow hrs.	16	8	8	8	8	10.0 hrs. 6 p. m.-6 a. m.						
						Rate of flow same as in Feb.						
						0.45 6 a. m. 6 p. m.						
Avg. Velocity MM per sec.	0.17	0.34	0.34	0.34	0.34	6 p. m. 6 a. m. Velocity same as in Feb.						
Wt. of a cu. yd. lbs	1721	1730	1740	1735	1764	1766	1821	1818	1828	1898	1871	1770
Specific Gravity	1.02	1.03	1.03	1.03	1.05	1.05	1.08	1.08	1.08	1.13	1.11	1.05
Water %	93	93	92	92	92	92	88	88	86	82	82	91
Solids	7	7	8	8	8	8	12	12	14	18	18	9
Volatile Matter	3.6	3.8	4.5	4.6	4.4	4.8	6.1	5.5	6.8	6.4	6.4	4.3
Nitrogen	0.15	0.16	0.17	0.20	0.24	0.19	0.29	0.25	0.29	0.30	0.30	0.21
Fats	0.44	0.41	0.52	0.44	0.39	0.41	0.38	0.58	0.69	0.61	0.61	0.40
*Cu.yd. wet sludge per mil. gals. sewage	5.22	4.9	4.1	4.1	5.5	6.1	5.4	4.6	4.5	4.6	4.9	7.3
Tons wet sludge per mil. gals.	4.55	4.2	3.5	3.6	4.9	5.4	4.9	4.2	4.1	4.4	4.6	6.4

*These quantities represent the increase in sludge since previous measurements and not the quantities from beginning of experiment or cleaning of tanks.

**Tank cleaned.

to consider the amount of sludge on hand at the expiration of comparatively long periods of time, corresponding with the dates upon which it was necessary to remove the sludge from the tank. The tank could have been run somewhat later than December 3, without cleaning, although it would not have been possible to have continued operations through the winter, without removing the sludge. It would, therefore, seem to be fair to consider the cleaning of December 3rd as the reasonable end of the summer period and to assume that with a tank of the design an ddismensions of the one used in the experiments, it would be necessary to remove the sludge at about this time each year. When the tank was cleaned on June 12, 1909, there was a very large accumulation of sludge, and it would not have been possible to continue operations longer without removing it. In fact, the tank would doubtless have done better work had it been cleaned somewhat earlier.

A summary of data relating to sludge calculated upon the periods from the beginning of the experiments to December 3rd, and from December 7, 1908, to June 12, 1909, respectively, is presented in the following table:

TABLE XXXIX.

Data Relating to Sludge Removed from Septic Tank at End of Summer and Winter Periods.

Period of Operation.	Apr. 3, '08, to Dec. 3, '08.	Dec. 7, '08, to June 12, '09.
Days tank was in operation	220	188
Total gallons treated	7,440,000	9,333,000
Specific Gravity	1.03	1.11
Wt. per Cu. Yds. (lbs.)	1,735.	1,871.
Water (%)	92	82
Volatile Matter (%)	4.6	6.4
Nitrogen (%)	0.20	0.30
Fats (%)	0.44	0.61
Tons wet sludge per mil. gals	3.56	4.6
Cu. Yds. Wet Sludge per mil. gals	4.1	4.9 (4.5)*
Cu. Yds. Wet Sludge per mil. gals. based upon 10% solids	3.18	9.23 (6.35)*

*Weighted average.

Sludge 10% solid—Sp. Gr. 1.06. Weight per cu. yd. 1790 pounds.

From the foregoing table it appears that the weighted average of sludge produced per million gallons duriug the entire time the septic tank was in use was 4.5 cubic yards, equivalent to 0.091% of the flow of sewage passing through the tank.

The density of the sludge to be removed from a septic tank will vary from time to time and therefore for the sake of comparison it is convenient to reduce the figures to a uniform basis on the assumption of a sludge containing 90% water and a specific gravity of 1.06. Table XL has been prepared for the purpose.

TABLE XL.

Quantity of Sludge Removed from Septic Tank Reduced to Uniform Density.

Date.	Quantity of Sewage	As removed from tank. Cu. Yds. per M. gals.*	Quantity of Sludge. Calculated at 90% water Sp. Grav. 1.02 Cu. Yds. Per M gals.*	Total lbs. Dry Solids.	Lbs. Dry Solids per M Gals.*
Apr. 27-Dec. 3, '08.......	7,444,000	4.1	3.18	4,230	569
Dec. 3-June 12, 1909.....	9,333,000	4.9	9.23	15,460	1,656
*Million Weighted Av.....		4.5	6.35		

From the data given in Table XL it appears that about 19.05 cubic yards of sludge of a calculated density of 90% water should be produced each day if the entire flow of sewage were treated by this method, assuming the flow to average 3,000,000 gallons daily. Upon this basis, the total annual production of sludge would amount to about 6,960 cubic yards, or if calculated on a basis of the weighted average of sludge actually removed during the experiments (4.5 cu. yards per million gallons) the quantity would be 4,935 cubic yards, equivalent to 13.5 cubic yards per day. The actual quantity to be disposed of would vary from season to season and from year to year, dependent upon the condition of business, the degree of efficiency of the mill tanks, the intensity of septic action which can be maintained, and the density of the sludge at the time of cleaning the tanks. The activity of fermentation will itself vary according to the chemical character of the sewage and also according to the variations of temperature. This quantity of sludge is so large that with tanks as ordinarily constructed, it would probably be necessary to remove it at least as often as twice each year, and perhaps at more frequent intervals.

Quantity of Sludge Produced at Gloversville, Compared with that Produced Other Places.

The quantities of sludge produced at Gloversville and at the experiment stations at Lawrence and Boston, Mass., and Columbus, Ohio, and at the large plant at Worcester, Mass., are given in Table XLI.

TABLE XLI.

Quantity of Sludge Produced by Septic Tanks in Various Places.

Place.	Time Required to fill tank at rate of sewage flow. Hrs.	Dry Solids lbs. per m. g. sewage.	Actual Sludge cu. yds. per m. g. sewage.	Sludge calc. to 90% water c. y. per m. g. sewage.
Gloversville:				
Summer Period.	8	569	4.1	3.18
Winter "	6–10	1656	4.9	9.20
Avg. (weighted)			4.5	6.35
Worcester, Mass.				
1901-1902	28–17	290	3.9	1.62
1902-1903	28–11	354	1.5	1.98
Lawrence, Mass.				
Tank A. 1898-04	42–14	286	...	1.60
" A. 1904-06	12+36	202	...	1.13
" G.	6	99.7	...	0.56
" H.	18	167.8	...	0.94
Columbus, Ohio.				
Tank A.*	13.9	420	1.4	2.35
" B.*	21.8	580	1.8	3 25
" C.*	8.0	240	0.8	1.34
" D.*	4.0	400	1.5	2.23
" E.	8.0	860	2.9	4.80
Boston, Mass.				
Tank 5.	48–12	178	1.4	1.00
" 7.	12	115	0.6	0.64
" 8.	48	510	4.7	2.85
" 9.	24	279	1.7	1.56
" 10.	24	282	1.5	1.58

*Sewage passed through grit chamber before entering septic tank.

From available records of sludge produced at these places, it appears that the quantity removed from the tanks at Gloversville is far in excess of that produced by most of the tanks included in this comparison. One tank, No. 8, at Boston, produced about the same amount as the tanks at Gloversville, while at Worcester during the first experiment the quantity produced was large although somewhat less than at Gloversville. All of the other tanks produced but a small fraction of the amount removed from the tanks at Gloversville.

Taking into account the density of the sludge from respective tanks and calculating the volume upon the basis of sludge of uniform density of 90% water, it appears that the sludge produced at Gloversville is far in excess of that produced by any of the other tanks. It would appear from these calculations that the quantity produced at Gloversville would be three or four times as great as that produced at other places.

Quantity of Dry Solids in Sludge.

There is variation from time to time in the actual weight of solid matter in the sludge as well as in its volume. Table XLII gives the weight of solids per million gallons of sludge, as found upon the several dates of examinatioin.

TABLE XLII.

Quantity of Solids in Sludge of Septic Tanks.

Date.	Lbs. per mil. gals. sewage. Weight of Dry Solids
Aug. 26	628
Sept. 11	591
Nov. 9	565
Dec. 3	569
Jan. 9	781
Feb. 2	868
Mch. 2	1174
Apr. 3	1010
May 5	1163
June 3	1590
June 12	1647
July 6	1158

The figures in Table XLII represent the weight of solid matter added to the sludge between each two consecutive dates and cannot be applied to entire periods from the beginning of operation of the tanks to the time of cleaning.

It appears that the amount of solid matter retained in the septic tank during the period of active fermentation was materially less than that produced during the winter and spring of 1909. The possible causes of this variation have already been fully discussed.

Suspended Solids Removed from Sewage Compared with Solids Found in Sludge.

In Table XLIII are given in pounds per million gallons the quantity of dry solid matter present in the sewage entering the septic tank and in the effluen therefrom, and the diifference which represents the amount which was removed from the sewage. In the fifth column of the table is given the quantity of solids found to have been added to the accumulation of sludge on each of the dates specified. The dates when the sludge was measured and analyzed correspond in a general way with the different months in the first column and the quantities in the fifth column may be taken to represent approximately the quantity of solids collected in the tank from month to month.

A comparison of the quantity of solids found in the sludge with the quantity calculated to have been removed from the sewage, shows that in general during the warmer season of the year from 65 to 80% of the solid matter which was removed from the sewage disappeared and did not remain in the tank. During the colder portion of the year from one-third to one-half of the solid matter removed from the sewage disappeared and was not found in the sludge. There are, of course, great difficulties in the way of sampling and analyzing the sludge, and comparisons of this kind are always unsatisfactory. The indications are, however, that about twice as much solid matter is liquified or lost during the warmer portion of the year when septic action is more pronounced as during the colder portion of the year.

TABLE XLIII.

Suspended Solids Removed from Sewage Compared with Solids Found in Sludge.

Date.	Influent.	Effluent.	Removed by Tank.	Found in Sludge.	% Lost.	Date on which Sludge was tested.
	Pounds of Dry Solids per Million Gallons of Sewage.					
May, 1908....	1146	578.5	5567.5	....	....	
June..........	1910	560.	1350.	....	....	
July..........	2862	728.	2134.	628	70.5	Aug. 26
August........	3740	963.	2777.	591	78.6	Sept. 11
September....	2948	929.	2019.	565	72.0	Nov. 9
October.......	3215	1197.	2018.	569	71.8	Dec. 3
November.....	3280	1021.	2259.	731	65.3	Jan. 9
December.....	2545	636.	1909.	868	54.5	Feb. 2
January, 1909.	2930	728.	2202.	1174	46.7	Mar. 2
February......	3935	737.	3198.	1010	68.4	Apr. 3
March........	2252	745.	1507.	1163	22.8	May 5
April.........	3280	720.	2560.	1590	37.9	June 3
May..........	4330	938.	3392.	1647	51.5	June 12
June..........	4488	896.	3592.	1158	67.8	July 6
Average	3410	837.	2573.	1174	54.4	

Chemical Composition of Sludge.

Table XLIV shows the proportion of volatile matter, nitrogen and fats in the sludge upon the various dates of measuring and sampling.

TABLE XLIV.

Analyses of Dry Sludge from Septic Tank.

Date.	Volatile	Nitrogen	Fats
	(Per cent.)		
August 26.....	51.5	2.1	6.3
September 11.	54.4	2.3	5.9
November 9...	56.3	2.1	6.5
December 3...	57.5	2.5	5.5
January 9....	55.0	3.0	4.9
February 2...	60.0	2.4	5.1
March 2......	50.8	2.4	3.2
April 3.......	45.8	2.1	4.8
May 5........	48.5	2.1	4.9
June 3	35.6	1.7	3.4
June 12.......	35.6	1.7	3.4
July 6........	47.8	2.3	4.4
Average....	49.9	2.225	4.85

It appears that the proportion of volatile matter in this sludge was highest during the month of February, when it was 60% of the total. There was a marked decrease in the proportion of organic matter during the months of April, May and June. This decrease was probably due partly to road detritus carried into the sewers by storm water and the water from melting snow, and partly to an excessive amount of inorganic matters passing the mill tanks which in some cases were also affected by surface water.

With the exception of the months of very high water the proportion of nitrogen in the sludge did not vary far from 2.5%, but with an increased proportion of inorganic matter during the spring months, there was a decrease in the proportion of nitrogen.

The proportion of fats varied in a manner similar to that of organic matter and nitrogen. With the exception of the spring months the proportion of fats amounted to from 0.40% to 0.52% and during the spring to about 0.60% of the wet sludge.

Quantity and Character of Sludge Collected in the Several Compartments of Septic Tank.

In order to determine the quantity of sludge which would be deposited in different portions of the tank, sludge dams were constructed as already described, dividing the tank transversely into four compartments of equal area. In Table XLV are recorded the depth and cubic feet of sludge in each of the several compartments upon the dates when measurements were made:

TABLE XLV.

Depth and Volume of Sludge Deposited in the Several Sections of Septic Tank.

	Septic Tank A.							
Date when sludge was measured.	Section No. 1.		Section No. 2.		Section No. 3		Section No. 4.	
	Depth in Feet.	Cubic Feet in Section.	Depth in Feet.	Cubic Feet in Section.	in Feet. Depth	Cubic Feet in Section.	Depth in Feet.	Cubic Feet in Section.
1908.								
Aug. 26th	1.0	64	2.0	128	1.7	109	1.4	90
Sept. 11th	1.25	80	1.9	124	2.1	133	2.0	128
Nov. 9th	2.6	166	2.8	179	2.7	173	2.7	173
Dec. 3rd*	3.1	198	3.6	230	3.2	205	3.0	192
1909.								
Jan. 9th	1.8	113	1.5	93	0.53	33	0.0	...
Feb. 2nd	3.8	231	2.1	132	1.1	69	0.5	31
Mch. 2nd	5.1	320	2.4	148	1.6	99	0.7	44
Apr. 3rd	5.8	363	3.2	199	1.9	117	0.8	49
May 5th	6.8	421	3.9	238	2.5	160	1.5	93
June 3rd	8.12	501	5.26	324	3.1	191	1.6	98
June 12th*	8.12	501	5.36	330	4.9	302	1.6	99
July 6th	2.2	137	0.46	28	Less than 0.3	...	Less than 0.3	...

* Tank cleaned.

From these measurements it appears that during the summer period, including measurements made upon August 26, September 11, November 9, and December 3, the active fermentation going on in the sludge causes it to be spread at practically a uniform depth throughout the several compartments.

Obviously the sludge which falls to the bottom of the tank in the first compartment and which is carried up again into the water above the sludge is swept further along the tank by the current and settles in the succeeding compartments. Similar action in the second compartment will carry some of the sludge into the third and fourth compartments. Such action was largely responsible for the increased amount of suspended matter which found its way out of the tank with the effluent during periods of septic activity, as already described.

The marked difference in the proportion of sludge in the several compartments collected during the colder weather when there is comparatively little fermentation going on, is very striking; for example, it appears that upon June 12, 1909, there was 8.12 feet in depth of sludge in the first compartment and only 1.6 feet in the fourth compartment.

The sludge at this time in the first compartment was dense and coarse in character, and remained at a height considerably exceeding that of the sludge dam. This may have been caused in part by the scumboard, which extended down about 2 inches below the top of the dam and was several inches nearer the inlet end of the tank. This condition is in marked contrast with that found in any of the measurements taken during the period of fermentation, leading to the conclusion that the sludge itself, without the assistance furnished by fermentation and the physical results thereof, will not be distributed uniformly over the bottom of the tank. When fermentation is not active, the depth of sludge in the respective compartments gradually decreases toward the outlet end of the tank, the rate of reduction from section to section being fairly uniform.

The comparative density of the sludge and its chemical composition from compartment to compartment and from time to time are given in Appendix G.

From Table XLVI it appears, as would be expected from the foregoing discussion, that the density of sludge in the first compartment is greater than that in the other compartments. It is more uniform in the several compartments, of course, during the period of active fermentation than during the winter and spring, when there is such a large accumulation of heavy material in the first compartment.

TABLE XLVI.

Density and Composition of Sludge in the Several Compartments of Tank.

Averages of Monthly Determinations.
Septic Tank.

Compartment.	Wt. per cu. yd. (pounds.)	Specific Gravity.	Water (percent.)	Volatile Matter in Dried Samp. (percent.)	Nitrogen in Dried Sample (percent.)	Fats in Dried Sample. (percent.)
1	1,794	1.06	87.4	53.1	2.23	4.71
2	1,779	1.05	89.5	53.8	2.43	5.15
3	1,760	1.04	91.5	51.8	2.56	5.30
4	1,769	1.04	91.6	50.8	2.48	5.68
Average	1,777	1.05	90.2	52.6	2.42	5.19

In general it may be said also that the proportion of organic matter in the first and second compartments is slightly greater than that in the other sections. This obviously cannot be true at periods when large quantities of street detritus find their way into the sewers, but it is found to hold throughout the major portion of the year.

There is apparently no marked difference in the proportion of nitrogenous substances found in the sludge in the several compartments, although on the whole it may be stated that the nitrogen content is least iin the first section. During some of the tests there was a marked increase in the second, third and fourth compartments over that ini the first, while on the other hand, upon about an equal number of tests, the nitrogenous matters were found to be in excess in the first compartment.

On the average, there is a gradual increase in the proportion of fats found in the sludge of the several compartments(indicating, as would be expected, that the fats are carried along with the sewage and are deposited in the further sections of the tank.

EXPERIMENTS WITH SEDIMENTATION.

For the purpose of comparing the effect of simple sedimentation with that of septic treatment, a tank constructed as already described, was operated as a sedimentation tank at the same rates of flow as the septic tank. The sewage for the septic and settling tanks was measured from the grit chamber by means of orifices and after passing the same the two portions were kept entirely separate.

This test was begun upon July 20, 1908, and continued until July 6, 1909. The operation of this tank differed from that of the septic tank only in respect to the removal of the sludge, which was effected at intervals sufficiently frequent to prevent active fermentation, as indicated by the production of gas. The lengths of the several periods between cleanings are given in Table XLIX.

The physical action of this tank, as also to some extent of the septic tank, has doubtless been materially affected by the chemicals discharged into the sewers, which are capable of acting as coagulants, thus producing a natural chemical precipitation of the sewage. These chemicals are discharged at irregular times and in variable amounts, so that it was not to be expected that the natural precipitation process would be as efficient as if the chemicals were added under conditions permitting of accurate control.

The color of the effluent differed only slightly from that of the sewage entering the tank, the change being due either to the dilution of the highly colored sewage with that having less color, which came immediately before and after it, or to a precipitation of coloring matter with the suspended solids.

At no time was there any appreciable amount of scum, although there was at times a slight film of grease, such as would be found upon the surface of any sewage.

The length of periods of operation was determined by the quantity of gas being evolved. When the tank was first filled, after cleaning, no gas whatever was liberated and the tank was allowed to continue in use until gas was given off in small quantities. When evolution of gas became noticeable, the tank was in all cases cleaned.

The odor of the effluent was very similar to that of the crude sewage, and resembled that of the tannery wastes.

Quality of Effluent.

The tables of daily analyses of influent and effluent to this tank are compiled as Appendix H. The monthly averages of analyses of iinfluent and effluent are embodied in Tables XLVII and XLVIII.

The temperature of the sewage was reduced about one degree during its passage through this tank, as shown by the following tabulation:

	Nov.	Dec.	Jan.	Feb.	Mch.
Temperature of Influent	52	49	47	46	45
Temperature of Effluent	51	48	46	46	44

The amount of suspended matter in the effluent remained fairly constant from August to February inclusive and it may be stated fairly that the tank was capable on the average of reducing the amount of suspended matter to 75 parts per million. During the latter part of the winter and the spring, there was a decided increase in the quantity of suspended matter in the effluent. This change was probably due to the large accumulation of sludge in the tank, thus reducing its efficiency.

Both Nitrites and Nitrates were present in practically all of the samples analyzed.

Dissolved Oxygen was absent for a portion of the month of October, but was present throughout the remainder of the period covered by the tests.

The changes effected by passing the sewage through this tank may be seen from the following tabulation of the average of all the analyses:

	Influent.	Effluent.	Per cent Removed.
Total Organic Nitrogen	22.6	13.0	46.0
Nitrogen as Free Ammonia	11.9	13.	—9.25
Nitrogen as Nitrites	0.32	0.32	0.00
Nitrogen as Nitrates	0.825	0.54	34.5
Total Oxygen Consumed	100.0	57.	43.00
Chlorine	145.	121.	16.5
Total Suspended Matter	388.	81.	79.
Volatile " "	230.	61.	73.5
Fixed " "	158.	20.	87.
Alkalinity	224.	213.	4.9
Oxygen Dissolved	1.73	2.6	—5.00

The increase in Free Ammonia, although comparatively slight, indicates that there was a small amount of septic action in the tank. This indication is also borne out by the reduction in Nitrates, although the Dissolved Oxygen showed a slight increase.

The proportion of nitrogenous and carbonaceous organic matter removed from the sewage, as indicated by the Organic Nitrogen and Oxygen Consumed, amounted to over 40%, while 79% of the Total Suspended Matter was removed. The change in the amount of Alkalinity was comparatively insignificant.

Sludge Retained by Settling Tank.

The sludge retained in the several compartments of the tank was of a light gray color and not particularly offensive in odor. The odor, however, was stronger, as would be expected, during the warmer weather. At all times the odor of tannery wastes was present to a marked extent in the sludge

Table XLIX shows the results of measurements and analyses of sludge collected by tank at all times when it was cleaned and on a few occasions when the sludge was not removed.

These examinations show very clearly the effect of frequent cleaning upon the density of the sludge. When it is necessary to remove the sludge at frequent intervals, it can hardly be hoped to reduce it to a density of more than 6 or 8% solids. On the other hand, if the sludge can be allowed to accumulate during the winter when there is little bacterial action, it may reach a density of 12% or 13% solids. It naturally follows from these conditions that the volume of sludge to be disposed of during the warmer portion of the year is far in excess of that to be removed during the winter or spring. The density of the sludge also depends upon the character of the suspended matters escaping from the mill tanks and will also undoubtedly vary from time to time according to the condition of business.

To enable the work of the settling tank during the summer season to be compared with that accomplished during the winter season, the results of tests from July 20 to December 24, have been combined as have those from December 24 to May 5. The results of these calculations appear in Table L.

Quantity of Dry Solids in Sludge.

The quantity of solid matter contained in the sludge when the tank was cleaned and at other times when tests were made, is shown by Table XLIXa.

TABLE XLVII.

Monthly Averages of Chemical Analyses of Influent to Settling Tank.

1908-9 Date	Parts per Million.											
	Temp. Deg. F.	Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
August	63	20	11.7	0.23	0.52	90	112	447	280	167	196	....
September	62	21	12.0	0.22	0.56	108	134	352	216	136	217	0.88
October	57	23	12.0	0.26	0.60	110	128	384	229	155	215	2.15
November	52	23	14.0	0.31	0.62	101	141	392	225	167	290	1.42
December	49	21	13.0	0.29	0.93	87	165	304	201	103	208	1.40
January	47	23	12.0	0.31	1.11	96	164	294	189	105	215	2.70
February	46	26	11.0	0.44	1.20	115	190	516	281	235	221	2.50
March	45	20	11.0	0.44	1.40	82	125	257	151	106	210	3.60
April	46	19	8.8	0.68	1.80	84	104	359	190	169	191	3.00
May	51	28	11.0	0.57	1.40	96	170	554	245	309	212	2.60
June	57	32	14.0	0.45	0.62	105	206	556	274	282	237	1.70
Weighted Average	54.5	22.6	11.9	0.32	0.825	100.0	145	388	230	158	224	1.73

TABLE XLVIII.

Monthly Averages of Chemical Analyses of Effluent from Settling Tank.

1908-1909 Date	Temp. Deg. F.	Parts per Million. Nitrogen: Organic: Total	Organic: Dissolved	Organic: Suspended	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed: Total	Oxygen Consumed: Dissolved	Oxygen Consumed: Suspended	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
August, 1908	..	10.0	6.1	4.0	14.0	0 05	0.11	47	30	17	118	74	54	20	206	....
September	..	9 8	...	...	16.0	0.08	0.05	60	..	..	...	79	62	17	225	....
October	56	12.0	...	...	14.0	0 15	0.15	59	..	..	124	71	52	19	221	0 0
November	51	12 0	...	...	15.0	0 38	0.28	55	..	..	131	75	57	18	271	0.58
December	48	14.0	...	...	13.0	0 40	0 64	57	..	..	162	87	66	21	202	2 8
January, 1909	46	16 0	...	...	11 0	0.39	1.00	64	..	..	161	79	63	16	203	3.6
February	46	16.0	...	...	9 8	0.23	1.70	68	..	..	173	80	66	14	194	3.8
March	44	15 0	...	...	11.0	0 44	1 60	57	..	..	124	90	64	26	192	4.6
April	45	13 0	...	...	9.1	0 92	1 50	48	..	..	...	80	56	24	...	4.4
May	51	17.0	...	...	11.0	1.30	1.10	52	..	..	163	104	70	34	210	3 4
June	60	16.0	...	...	17.0	0 16	0.27	55	..	..	203	108	82	26	238	0 5
Average	50	13.0	6.1	4.0	13.0	0.32	0.54	57	30	17	121	81	61	20	213	2.6

TABLE XLIX.

Data Relating to Sludge Collected in Settling Tank.

(Results of Analyses given in Per cent. by Weight of Wet Sludge)

Dates of Measuring and Sampling.

	Aug. 8*	Sept. 3*	Oct. 8*	Nov. 21*	Dec. 24*	Feb. 2	Mar. 2	Apr. 3	May 5	June 3	July 6
Days in period	19	25	35	43	32 1–3	35	28	32	32	18	32
Total mil. gals. treated	0.44	0.62	0.81	2.00	1.50	1.70	1.39	1.59	1.59	0.89	1.59
Av. period flow. Hrs.	16	15	16	8	8	6 hrs. 6 a. m. 6 p. m. 10 hrs. 6 p. m. 6 a. m.		Period of flow same as in Feb.			
Av. velocity MM per second	0.17	0.18	0.17	0.34	0.33	0.45 6 a. m. 6 p. m. 0.27 6 p. m. 6 a. m.		Velocity same as in February.			
Wt. of a cu. yd. lbs.	1735	1780	1724	1774	1778	1752	1792	1795	1820	1810	1820
Specific Gravity	1.03	1.05	1.02	1.05	1.05	1.04	1.06	1.06	1.08	1.07	1.08
Water %	96	92	94	92	90	93	88	89	87	88	86
Solids %	4	8	6	8	10	7	12	11	13	12	14
Volatile Matter %	2.4	4.2	3.5	4.7	4.9	3.8	6.5	5.5	6.0	6.5	4.2
Nitrogen %	0.12	0.20	0.16	0.26	0.24	0.17	0.31	0.26	0.29	0.28	0.24
Fats %	0.23	0.41	0.32	0.50	0.46	0.37	0.49	0.42	0.49	0.61	0.53
Cu Yds wet sludge per million gallons	10.20	8.66	11.05	6.6	6.0	7.6	6.4	5.4	5.0	9.6	8.4
Tons wet sludge per million gallons	8.9	7.7	9.5	5.9	5.4	6.7	5.7	4.8	4.56	8.7	7.64

*Tank cleaned

TABLE XLIXa.

Quantity of Solids in Sludge of Settling Tank.

Date.	Weight of Dry Solids per. mil. gals. sewage.
Aug. 8	708
Sept. 3	1235
Oct. 8	1145
Nov. 21	939
Dec. 24	1075
Feb. 2	934
Mch. 2	1371
April 3	1605
May 5	1184
June 3	2088
July 6	2139
Average	1262

The weight of dry solids per million gallons which accumulated in this tank during the several periods in the fall, was comparatively uniform. After December 24, there was much variation in the results of the tests, which might have been due to the difficulties of sampling at times when the water was not drawn down, which was the case upon all occasions except that of May 5, when the tank was cleaned.

TABLE L.

Quantity of Sludge Removed from Settling Tank Reduced to Uniform Density.

Date.	Quantity of Sewage Gallons.	Quantity of Sludge. As Removed from Tank. Cu. Yds. per Mil. Gals.	Calculated as 90% water Sp. Gr. 1.02 Cu. Yds. per Mil. Gals.	Total lbs. Dry Solids.	Lbs. Solids per Mil. Gals.
July 20-Dec. 24	5,370,000	7.50	7.53	5495	1023
Dec. 24-May 5	6,300,000	5.01	5.09	7461	1184
Weighted Average..		6.07	6.21		

From these figures, assuming an average flow of sewage of 3,000,000 gallons per day, 6,650 cubic yards of sludge would be produced annually by sedimentation, if the whole of the sewage of the city were treated in tanks operated in the same manner as the experimental tank. Reducing the sludge to a uniform basis of 90% water, this quantity would be increased to 6,800 cu. yds. per year.

Quantity of Sludge Produced at Gloversville, Compared with that Produced at Other Places.

Table LI has been compiled to show the quantity of sludge produced at Gloversville during the winter and summer periods and at Worcester and Andover, Mass., and Columbus, Ohio. A comparison of the quantities of sludge produced at these various plants reduced to a uniform basis of 90%

water shows that the amount of sludge produced by the sedimentation process at Gloversville is less than that produced at Andover, and less than that produced during several periods of the experiments at Worcester. On the other hand, the quantity of sludge produced at Columbus was somewhat smaller than that at Gloversville. On the whole, it may be stated fairly that the quantity of sludge produced at Gloversville was equivalent to the average amount produced in the other cities.

TABLE LI.

Quantity of Sludge Produced by Sedimentation Tanks in Various Places.

	Time Required to fill tank at rate of sewage flow. Hrs.	Dry Solids lbs. per mil. gals. sewage.	Actual Sludge cu. yds. per mil. gals. sewage.	Sludge calc. to 90% water cu. yds. per mil. gals.
Gloversville,				
Summer Period	16	1023	7.50	7.53
Winter "	8	1184	5.01	5.09
Worcester,				
2 and 3 periods.........	28	1900	17.9	10.60
4, 5 and 6 "	16.8	1480	16.3	8.27
7, 8, 10, 11 "	11.2	780	8.3	4.36
12 and 13 "	8.4	480	8.0	2.68
Andover, Mass.				
1905	1.9	2500	.....	13.96
1906	1.85	1800	.....	10.01
Columbus, Ohio.				
Aug.Jun. Plain Settling.				
Tank A.........	8	720	3.3	4.03
Nov.-Apr. " B.........	8	760	3.7	4.25
Nov.-Apr. " B........	6	660	3.7	3.69

Suspended Solids in Sedimentation Tank Effluents, in Various Cities.

The quantity of suspended matter iu the effluent from settling tanks at Gloversville, N. Y., Worcester Mass., and Columbus, Ohio, has been found to be as follows:

	Pounds Suspended Matter per Mil. Gallons.	Parts per Million.
Gloversville, N. Y................................	676	81
Columbus, Ohio. Tank A.........................	652	78
" B........................	611	73
Worcester, Mass. Avg. of large scale experiments..	1200	144

From these figures, it appears that the effluents from Gloversville have compared fairly well with those obtained at Columbus, although averaging slightly higher. They have averaged much lower than the effluent produced from the large scale experiments at Worcester.

TABLE LII.

Depth and Volume of Sludge Deposited in the Several Sections of Settling Tank B.

Date when Sludge was measured. * * * * *	Section No 1.		Section No. 2		Section No. 3		Section No. 4	
	Depth in feet.	Cu. ft. in tank.	Depth in feet.	Cu. ft. in tank.	Depth in feet.	Cu. ft. in tank.	Depth in feet.	Cu. ft. in tank.
1908								
August 8*.....	....	...	....	.....	....	.....	....	.....
Sept. 3*.....	1.1	70	.44	27	0.40	24	0.40	24
Oct. 8*........	1.4	87	0.98	63	0.87	56	0.56	36
Nov. 21*......	1.7	109	1.6	102	1.2	77	1.1	70
Dec. 24*......	1.2	79	1.0	64	0.75	48	0.83	53
1909								
Feb'y 2.......	1.8	113	1.3	84	0.98	63	1.5	95
March 2......	3.1	198	2.0	128	1.8	115	1.7	96
April 3........	4.2	268	2.5	163	2.2	139	2.2	140
May 5*.......	5.3	336	2.7	182	2.52	174	2.49	160
June 3........	1.45	93	0.94	60.2	0.62	39.7	0.59	37.8
June 16.......	2.45	157	1.34	85.8	1.02	65.3	0.89	57.0
July 6........	3.65	234	2.04	130.6	1.62	103.7	1.34	85.8

*Tank cleaned.

From Table XLIX it will be seen that the density of the sludge varied from a specific gravity of 1.02 to 1.08, and from 86% to 96% water.

Measurements and Analyses of Sludge in the Several Sections of Tank.

The sludge was removed from the tank at frequent intervals during the warmer weather. After December 24, however, it was allowed to accumulate until May 5, when the tank was cleaned. After this date the sludge was allowed to remain in the tank, although it was measured at frequent intervals. The results of the measurements of the depth of sludge and the cubic feet of sludge retained in the several sections of the tank, as calculated from the depths, are given in Table LII.

The sludge in the several compartments of the tank was analyzed and tested at the various times when it was measured. The results of these examinations appear in detail in Appendix G. A summary of these results, however, is given in Table LIII:

TABLE LIII.

Density and Composition of Sludge in the Several Compartments of Tanks.

Averages of Monthly Determinations.

Settling Tank B.						
	Wt. of Wet Sludge per Cd. Yd. (lbs.)	Sp. Gravity.	Water %	Volatile Matter %	Nitrogen %	Fats %
Sec. 1......	1791	1.06	89	56.7	2.42	5.19
Sec. 2......	1768	1.05	91	52.6	2.52	5.12
Sec. 3......	1767	1.05	92	52.1	2.70	5.02
Sec. 4......	1763	1.05	92	53.6	2.57	4.25
Average	1776	1.05	91	53.8	2.56	4.91

From the examinations made, it appears that there was a gradual decrease in the weight and specific gravity of the sludge toward the outlet end of the tank. Following this change in weight, the per cent. of water is found to be less in the first and second, than in the third and fourth compartments. The proportion of volatile or organic matter was materially greater in the first compartment than in any of the others and was comparatively uniform in the second, third and fourth sections. The proportion of nitrogen was highest in the third compartment and lowest in the first, indicating that there was a tendency to carry the nitrogenous substances away from the inlet end of the tank. The fats, however, were found in greatest amount in the first section and showed a gradual reduction through the second and third sections, with a marked increase in the fourth compartment.

Solids in Effluent, Influent and Sludge.

The results of computations to show the proportion of the solids removed from the sewage which is unaccounted for by the solid matter found in the sludge, are given in Table LIV.

TABLE LIV.

Suspended Solids Removed from Sewage Compared with Solids Found in Sludge.

Date.	Pounds per Million Gallons Dry Solids.					Dates of Analyses
	Influent	Effluent	Removed by tank.	In Sludge	% lost	
Aug., 1908..	3740	619	3121	708	77.3	Aug. 8
Sept. ..	2945	661	2284	1235	45.8	Sept. 3
Oct. ..	3212	594	2618	1145	56.4	Oct. 8
Nov. .	3280	628	2652	939	64.6	Nov. 21
Dec. ..	2542	728	1814	1075	40.7	Dec. 24
Jan., 1909..	2460	661	1799	934	48.1	Feb. 2
Feb. ..	4315	670	3645	1371	62.4	Mar. 2
Mar. ..	2150	753	1397	1065	24.6	Apr. 3
Apr. ..	3003	670	2333	1184	49.2	May 5
May ..	4636	870	3766	2088	44.5	June 3
June ..	4650	904	3746	2139	42.8	July 6
Average....	3240	677	2563	1262	50.7	

The quantity of dry solid matter in the influent and effluent is calculated from the averages of monthly analyses and the amount retained in the tank is the difference between these two calculations. The sludge was measured and analyzed about once in four weeks, thus giving an approximate idea of the amount of solid matter which accumulated between the measurements. In preparing Table LIV, it has been assumed that these measurements and the corresponding analyses corresponded in a general way with the figures prepared from the averages of monthly analyses of sewage and effluent. These figures are, of course, not strictly comparable and too much weight should not be attached to them. It is interesting to note, however, that from the analyses of influent and effluent, an average of 2563 pounds of dry solid

matter disappeared and should have been retained in the tank or converted into soluble or gaseous matter. Compared with this only 1262 pounds of solid matter were found in the tank at the various times upon which measurements were taken. It would appear from these figures, that approximately 51% of the solid matters disappearing from the sewage during its passage through the tank, were also unaccounted for in the sludge found in the tank.

COMPARISON OF SLUDGE PRODUCED BY SEPTIC AND SEDIMENTATION PROCESSES.

It is interesting to compare the quantity of sludge removed from the septic and settling tanks. The following figures show the number of pounds per million gallons of solid matter found in the sludge of the two tanks, during the summer and winter periods, respectively:

	Septic Tank. Lbs. per Mil. Gallons.	Settling Tank. Lbs. per Mil. Gallons
Summer Period	569	1023
Winter "	1656	1184

It thus appears that the settling basin produced about 1.8 times as much sludge figured as dry solid matter during the summer period, as did the septic tank. On the other hand, the septic tank produced about 40% more sludge upon the same basis during the winter period.

For the sake of comparison, these quantities have been calculated into cubic yards of sludge of an assumed specific gravity of 1.06 and 90% water. Upon this basis the calculated amount of sludge would be as follows:

	Septic Tank. Cu. Yds. per Mil. Gals.	Settling Tank. Cu. Yds. per Mil. Gals.
Summer Period	3.18	7.53
Winter "	9.23	5.09
Weighted Averages	6.35	6.21

From this comparison it appears that during the entire time covered by both seasons, the amount of sludge produced by the septic tank was a little greater than that produced by the settling tank. The septic tank, however, had the advantage due to a longer period of storage during the warmer season of the year, which resulted in producing a denser sludge than could be produced by the settling tank, when operated with a view to avoiding excessive fermentation. The quantities of sludge actually produced during the periods covered by the foregoing discussion, were as follows:

	Septic Tank. Cu. Yds. per Mil. Gals.	Settling Tank. Cu. Yds. per Mil. Gals.
*Summer Period	4.1	7.50
Winter "	4.9	5.01
Weighted Averages	4.5	6.07

On this basis and assuming that the periods covered by these experiments each represent fairly one-half of the year, it appears that the quantity of sludge produced by the two processes was 4.5 and 6.07 cubic yards per million gallons, respectively. In other words, the septic process reduced the amount of sludge which would have been obtained by sedimentation by 26.0%. The reduction during the summer period was 45.4%, while during the winter period the reduction was 2.0%.

Note:

Average measurements of whole flow of sewage, 7 summer months .... 2,034,000 g.p.d.

Average measurements of whole flow of sewage, 10 winter months .... 2,952,000 g.p.d.

RESULTS OF EXPERIMENTS WITH SPRINKLING FILTERS.

The sprinkling filters were brought into use during August and September, 1908, as follows:

Number 1.	August 24
" 2.	September 2
" 3.	August 29
" 4.	August 28

From the date of starting until October 23, the net rate of flow per acre per day was as follows:

Number 1.	600,000 gallons
" 2.	695,000 "
" 3.	600,000 "
" 4.	636,000 "

Upon October 23 the quantity of sewage applied to the filters was increased to:

Number 1.	1,000,000 gallons per acre per day
" 2.	" " " " " "
" 3.	" " " " " "
" 4.	" " " " " "

Upon December 1st the quantity of sewage applied to the filters was again increased so as to make the average net rate of filteration per acre per day as follows:

Number 1.	1.18	million gallons.
" 2.	1.06	
" 3.	1.00	
" 4.	1.20	

The filters were provided with the standard Columbus nozzles from each of which one of the arms was removed. The openings of these nozzles were reduced to the proper size to furnish the quantity of water required under a constant head of five feet. The sewage was applied in this manner continuously throughout periods of seven days, at the end of which the filters were allowed to rest twenty-four hours.

The distribution obtained was not all that could be desired. If the distribution provided for the completed plant is materially better than that of the experimental filters, it will be reasonable to expect somewhat better results. By conducting the experiments with the Columbus nozzles, however, results were obtained which were undoubtedly on the safe side and it is probable that some improvement may be realized in the completed plant.

Comparatively little trouble was experienced with the clogging of the nozzles, although occasionally the openings were reduced in size by an ac-

cumulation due either to grease or to an organic growth. This accumulation was of such a nature and in such a position that it could not be readily removed from the inside of the nozzle by applying a stick or wire from the outside. The freedom from internal parts was an important feature in avoiding serious trouble from this cause.

There was at no time any difficulty due to clogging of the filtering material and no tendency was observed toward cooling of the water applied to the filter.

More or less odor was always given off from the influents as they were sprayed onto the filters. This odor was similar to that arising from septic and settling tanks, although much more pronounced, due to the mechanical breaking up of the water into fine drops, furnishing a better opportunity for the evolution of gas. While these odors were pronounced and would doubtless be noticeable for some distance from a large area of filter, they were not very offensive, or of a pronounced putrefactive nature, and were readily recognized as similar to those of tannery wastes.

The cold weather caused no difficulty in the distribution of sewage upon the filters which were housed, for the reason that the temperature within the buliding did not drop to 32° Fahrenheit, except on two occasions, and only on one occasion below 32°.

Filter No. 4 was maintained in operation without any serious difficulty,—the ice accumulated on the surface of the filter to a large extent, but there was always an opening about half-way from the nozzle to the outside of the filter, where the water fell in greatest quantity, which was ample for the admission of the influent. No effort was made to remove any ice from the surface of the filter, and this ice reached a thickness of 18 inches around the outer edge. The zone of ice around the outer edge of the filter was approximately 2.5 feet wide, inside of which was an open zone about 2 feet wide, within which was a second zone of ice about 2 feet wide or 4 feet in diameter. Thus out of 130.68 square feet of total area 37.7 square feet or 28.9 per cent. of the whole area remained open for the reception of the sewage. The ice extended across the open zone at a point opposite the arm of the nozzle where comparatively little water fell, thus still further decreasing the effective areas. The effect of the covering of so large a proportion of the surface of the filter with ice was not as important as would appear from a mere consideration of this particular condition, for the reason that under all conditions a very large proportion, as high doubtless as 50 to 60% of the influent, was applied to this particular zone of the filter. Had the distribution been uniform over the entire area during the warmer season of the year, the covering of nearly 70% of the area with ice would doubtless have proven a serious obstacle in the way of the efficient action of the filter during the winter season.

The surfaces of the stone of the filter were covered with slime, but at no time was there a noticeable organic growth over the surface of the filter as a whole. At times it appeared that there was a slight tendency toward such a growth on the filters within the building and no corresponding tendency on the exposed filter. The extent of growth was, however, so small that no importance has been attached to it.

There was at no time any evidence of an incrustation of lime salts upon the stones or of a clogging due to the presence of chemicals as distinguished from the ordinary suspended matter of sewage.

The proportion of the filter beds made up of voids was determined when they were put into operation and again after a period of operation varying from 36 to 51 days. The results of these determinations were as follows:

TABLE LV.

Voids in Sprinkling Filters.

	Voids at Beginning of Experiment (%)	Period between 1st and 2d measurements of Voids (Dys.)	Voids at end of Period of Operation (%)	Loss of Voids (%)
Filter No. 1	47.24	51	46.33	.91
" No. 2	47.12	36	45.99	1.13
" No. 3	47.73	38	35.23	12.50
" No. 4	48.97	40	47.41	1.56

No reason can be offered for the great reduction in the proportion of voids in filter No. 3 during the first thirty-eight days of its operation. A large quantity of suspended matter previously retained in this filter was discharged with the water used for measuring the voids. A second measurement indicated that the filter had been cleaned and the proportion of voids returned to 47.66% of the total space occupied by the filtering material, thus showing a loss similar to that of the other filters and amounting to 1.6%. The filtering material has been examined to a depth of about 18 inches from the surface and it is found that there is a much larger accumulation of suspended matter as sludge in the zone receiving the largest proportion of the influent, than in other portions of the filter. The accumulation was nowhere so large as to cause clogging, or even to indicate that a period of clogging was at hand.

During the month of April, myriads of light colored minute flies were hatched upon the under side of the stones, on the surface of the filters. When the flies developed they appeared to find their natural home on or near the surface of the stones and did not tend to leave the filter. They were present in vast numbers, but while they might make working about the filters uncomfortable, they invariably showed no tendency to leave them.

SPRINKLING FILTER NO. 1.

This filter, which was 10 feet in depth, has received the effluent from the septic tank since August 24, 1908. The net rate of 600,000 gallons per acre per day was increased on October 23 to one million gallons. A still further slight increase in the actual quantity of sewage matter applied was made upon December 1st, when the rate of pumping was changed so as to regulate the flow of sewage through the septic and settling tanks in general accordance with the rate of flow in the trunk sewer. This change in the operation of the tanks resulted in forcing the strong sewage of the day time through them and therefore onto the filters earlier in the day, and in retaining the strong sewage in the tanks slightly longer at night, consequently applying it to the filters a somewhat longer time than was the case before the change in the rate of pumping was made.

The averages of the monthly analyses of the influent and effluent appear in Tables LVI and LVII. The results of daily analyses upon which these averages are based appear as Appendix I.

The net results of the work of this filter are clearly shown by the following tabulation of averages of all analyses of influent and effluent together with the percentage of the various constituents removed by the process of filtration.

	(Parts per Million)		
	Influent.	Effluent.	% Removed.
Organic Nitrogen	14	3.5	75
Free Ammonia	14	8.0	43
Oxygen Consumed	61	22.0	64
Total Suspended Solids	107	29.0	73
Volatile " "	76	22.0	68
Fixed " "	.31	7.0	78
Nitrogen as Nitrites	0.35	1.48	323 increase
Nitrogen as Nitrates	.62	4.78	671 "
Dissolved Oxygen	2.25	6.40	184 "

From the determinations of organic nitrogen, oxygen consumed and total suspended matter, it appears that about 70% of the impurities contained in the influent, which was the effluent from the septic tank, were removed by the process of filtration. The nitrites, nitrates and dissolved oxygen, were all materially increased during the passage of the water through the filter.

The quantity of suspended matter applied to the filter was much more during the first four months of its operation than during the winter and spring, due to the fermentation going on in the septic tank, which has been described under that caption.

The quality of the effluent has been quite uniform throughout the period covered by the experiments, although the analyses appear to indicate that the increase in the work put upon the filter after October 23, when the rate was increased to 1,000,000 gallons per acre per day, was reflected in an increased amount of nitrogenous matters in the effluent. There was also a slight reduction in the amount of nitrites and nitrates following the increase in rate. This apparent deterioration of the effluent was, however, overcome

TABLE LVI.

Monthly Averages of Results of Chemical Analyses of Influent to Filter No. 1. Source of Influent, Septic Tank.

INFLUENT Parts per Million.											
1908-1909	Temperature Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Dissolved Oxygen
Date	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
August	..	..	12.0	15.0	56	122	82	40	0.09	0.09	....
September	..	..	11.0	16.0	63	105	74	31	0.12	0.09	....
October	56	54	12.0	15.0	67	125	84	41	0.25	0.17	....
November	51	49	14.0	16.0	65	125	88	37	0.32	0.42	0.71
December	48	47	14.0	13.0	55	83	61	22	0.38	0.87	3.4
January	46	45	17.0	12.0	67	90	67	23	0.42	1.06	2.8
February	45	44	16.0	10.0	62	86	66	20	0.46	1.50	3.8
March	44	43	15.0	10.0	55	89	70	19	0.50	1.70	4.1
April	45	45	13.4	9.8	51	83	59	24	0.85	1.70	4.6
May	52	53	19.0	11.0	55	114	76	38	0.74	1.10	2.6
June	58	60	17.0	16.0	55	95	70	25	0.33	0.49	0.6
Weighted Average	51	50	14.0	14.0	61	107	76	31	0.35	0.62	2.25

TABLE LVII.

Monthly Averages of Results of Chemical Analyses of Effluent of Sprinkling Filter No. 1.

EFFLUENT Parts per Million.									
1908	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Dissolved
	Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed	
August 25-30	5.3	11.	1.7	1.2	23	21	19	2	5.6
September	1.6	8.0	1.4	5.4	20	13	11	2	5.1
October	2.1	6.3	1.7	7.3	20	21	14	7	7.6
November	3.4	8.0	1.1	5.7	21	22	16	6	5.8
December	3.8	8.0	1.3	4.5	22	30	26	4	6.8
January	4.2	10.8	1.7	2.1	27	33	28	5	6.8
February	3.9	9.8	1.7	2.7	25	27	25	2	6.8
March	4.0	9.3	1.8	3.0	25	30	25	5	6.7
April	3.8	6.9	1.7	3.6	22	45	33	12	6.7
May	6.6	6.4	2.0	3.8	26	70	51	19	6.2
June	6.2	6.0	1.9	5.0	28	74	51	23	6.3
Weighted Average	3.5	8.0	1.5	4.8	22	29	22	7	6.4

later in the winter and spring when the chemical composition of the effluent showed some improvement. During the early months of operation the amount of suspended matter escaping with the effluent was considerably less than during the winter and spring. With the advent of warm weather in April, May and June, there was a decided increase in the quantity of suspended matter discharged from the filter. During no month, however, was the amount of suspended matter in the effluent equal to that in the influent, as shown by the chemical analyses.

The putrescibility tests showed that the effluent was of good quality from the beginning of the experiments until the end of December. During January and February about one-fifth of the samples were putrefactive. There was however, a marked improvement during the spring so that it seems to be safe to assume that the effluent from a 10-foot filter, receiving an influent of the character applied to this experimental filter, will not be putrescible over one-fifth of the time even though the suspended matter is not removed from it.

Filter No. 2.

This filter was 7 feet deep and received effluent from the septic tank at the net rate of 695,000 gallons per acre per day until October 23, after which time the rate was increased to 1,000,000 gallons per acre per day and further increased to 1,060,000 gallons on December 1st. The monthly averages of analyses of influents and effluents appear in Tables LVIII and LIX. The daily analyses from which these averages are calculated are tabulated in Appen-

TABLE LVIII.

Monthly Averages of Results of Chemical Analyses of Influent.
Source of Influent, Sprinkling Filter No. 2.

INFLUENT

Parts per Million.

Date 1908-1909	Temperature Deg. F. Influent	Temperature Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Dissolved Oxygen
September	..	..	11.5	16.0	66	113	80	33	0.14	0.10	....
October	56	53	13.0	15.0	71	142	93	49	0.21	0.30	0.00
November	51	49	13.9	15.5	65	124	89	35	0.318	0.42	0.71
December	48	47	14.0	13.0	55	83	61	22	0.38	0.88	3.40
January	46	45	17.0	12.0	67	90	67	23	0.42	1.10	2.80
February	45	44	16.0	10.3	62	86	66	20	0.46	1.50	3.80
March	44	43	15.0	10.0	55	89	70	19	0.50	1.70	4.10
April	45	45	13.0	9.8	50	81	57	24	0.91	1.70	4.80
May	52	53	19.0	11.0	55	114	76	38	0.74	1.10	2.60
June	58	60	17.0	16.0	55	95	70	25	0.33	0.46	0.60
Weighted Average	51	50	15.3	15.2	68	120	85	35	0.38	0.71	1.9

Monthly Averages of Results of Chemical Analyses of Effluent of Sprinkling Filter No. 2.

EFFLUENT

Parts per Million.

1908-1909 Date	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Dissolved
	Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed	
September	2.0	7.3	1.8	5.0	21	14	12	2	...
October	2.0	6.1	1.6	5.3	19	15	10	5	5.9
November	4.4	9.5	0.90	3.3	24	35	25	10	5.0
December	7.5	9.7	0.87	2.7	31	57	46	11	6.5
January	6.6	11.5	1.50	2.1	33	47	37	10	5.6
February	7.1	11.0	0.83	2.0	36	46	38	8	5.3
March	6.1	10.5	1.00	2.0	31	44	37	7	5.7
April	4.8	7.8	1.20	3.0	25	46	36	10	6.5
May	14.0	8.6	1.60	2.10	45	202	122	80	4.8
June	7.3	7.9	1.90	3.60	33	86	59	27	4.7
Weighted Average	5.0	8.6	1.3	3.6	27	44	32	12	5.6

dix J. The work of the filter during the entire period may be studied from the following tabulation of averages of all analyses of influent and effluent:

	Influent. (Parts per Million)	Effluent. (Parts per Million)	% Removed.
Organic Nitrogen	15.3	5.0	67.3
Nitrogen as Free Ammonia	15.2	8.6	43.4
Oxygen Consumed	68	27	60.3
Total Suspended Matter	120	44	63.3
Volatile " "	85	32	62.4
Fixed " "	35	12	65.8
Nitrogen as Nitrates	0.38	1.3	242.0 increase
Nitrogen as Nitrates	0.71	3.6	407.0 "
Dissolved Oxygen	1.9	5.6	195.0 "

The analyses indicate that about 60% of the impurities of the influent were removed during its passage through the filter. The nitrites, nitrates and dissolved oxygen in the effluent were all much greater than in the influent.

The effluent from this filter showed a marked increase in organic nitrogen after October when the rate of filtration was increased and no recovery was apparent up to the end of June. The nitrites and nitrates were less during the winter weather than during the fall or spring. The dissolved oxygen, however, did not show a reduction corresponding to the reduction in nitrites

and nitrates, the amount present in the effluent being fairly uniform throughout the experiment. It was always present in fairly large quantities, the monthly average never falling below 4.8 parts per million. There was a material increase in the amount of suspended matter contained in the effluent after October, the quantity remaining quite uniform until May when there was a great increase, due undoubtedly to the automatic cleaning of the filter.

During September and October, the effluent was non-putrescible on nearly all occasions. Immediately after the rate of flow was increased there was an increase in putrescibility, and in November 54% of the samples tested were putrescible. While there were marked variations in the percentage of samples which were putrescible, the effluent from this filter was found to be putrescible on fully one-half of the days upon which it was tested. It must be remembered, however, that the tests here referred to were made upon the effluent including the suspended matter which it carried. The effect of the removal of suspended matter upon the keeping qualities of this effluent, is discussed on pages 174 et seq.

Filter No. 3.

This filter was 5 feet in depth and received the effluent from the septic tank at the rate of 600,000 gallons per acre per day until October 23, after which time the rate was increased to 1,000,000 gallons per acre per day. The monthly averages of analyses of influent and effluent given in Tables LX and LXI show the work done by this filter from month to month. The individual analyses upon which these tables are based are given in Appendix K. The influent and effluent are compared in the following tabulation of results of analyses:

TABLE LIX.

	(Parts per Million)		
	Influent.	Effluent.	% Removed.
Organic Nitrogen	14	5.8	59
Free Ammonia	14	11.5	18
Oxygen Consumed	62	28.0	55
Total Suspended Solids	111	37.0	67
Volatile " "	78	29.0	63
Fixed " "	33	8.0	76
Nitrogen as Nitrites	4.33	1.4	325 increase
Nitrogen as Nitrates	1.65	1.6	145 "
Dissolved Oxygen	2.30	4.8	109 "

The purification as indicated by these analyses amounted to about 60%. The general character of the effluents from this filter has been fairly uniform, as shown by the analyses. The average analyses for each month showed nitrites and nitrates to be present and at no time even for a short period were these constituents absent. Dissolved oxygen was always present, most of the time being between 4½ and 6 parts per million.

TABLE LX.

Monthly Averages of Results of Chemical Analyses of Influent Sprinkling Filter No. 3.

INFLUENT

Parts per Million.

1908-1909 Date	Temperature Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Dissolved Oxygen
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
August	..	..	11.0	14.0	50	85	64	21	0.19	0.03	....
September	..	..	12.0	16.0	67	112	80	32	0.14	0.16	....
October	56	54	12.0	15.0	71	138	90	48	0.17	0.31	0.00
November	51	49	13.0	16.0	65	131	91	40	0.32	0.41	0.75
December	48	45	13.0	14.0	55	86	63	23	0.44	0.53	....
January	46	44	16.0	12.0	65	84	66	18	0.40	0.91	3.50
February	45	43	16.0	9.4	64	86	69	17	0.30	1.70	3.80
March	44	42	15.0	11.0	57	90	63	27	0.41	1.80	4.60
April	45	45	13.0	9.6	47	86	59	27	0.84	1.50	4.10
May	52	53	18.0	11.0	56	110	71	39	0.73	1.50	2.40
June	58	58	17.0	18.0	58	117	87	30	0.16	0.38	0.70
Weighted Average	51	49	14.0	14.0	62	111	78	33	0.33	0.65	2.3

TABLE LXI.

Monthly Averages of Results of Chemical Analyses of Effluent of Sprinkling Filter No. 3.

EFFLUENT

Parts per Million.

	Nitrogen				Oxygen Consumed	Ox. Consumed 5 Min. Cold Test	Suspended Matter			Oxygen Dissolved
	Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed	
August	5.7	11.0	4.5	0.51	25	...	27	24	3	...
September	4.8	12.0	1.8	1.3	30	...	35	27	8	...
October	4.5	10.0	1.5	2.0	26	...	28	21	7	5.4
November	5.7	13.0	1.0	1.50	28	...	32	26	6	4.5
December	7.2	12.0	1.1	1.90	27	...	29	25	4	5.0
January	5.9	13.0	1.3	1.90	30	...	37	30	7	5.2
February	7.7	13.0	1.1	1.60	38	...	62	50	12	4.8
March	5.7	12.0	1.2	1.50	29	...	44	33	11	6.1
April	4.5	9.6	1.5	2.1	22	...	25	22	3	6.2
May	7.4	9.4	2.0	1.5	27	...	55	39	16	5.1
June	7.6	11.0	1.3	0.50	32	7.7	62	50	12	2.9
Weighted Average	5.8	11.4	1.4	1.60	28		37	29	8.0	4.8

The effluent containing its suspended matter was found to be putrescible on a comparatively large number of days, amounting on the average to about

two-thirds of the time. In April only 7% of the samples tested were found to be putrescible, while in October 86% of them failed to keep. The effect of the removal of suspended matter upon the keeping qualities of this effluent is discussed on pages 174 et seq.

Filter No. 4.

This filter was 5 feet in depth and received the effluent from the settling tank at an average net rate of 636,000 gallons per acre per day until October 23, after which the average rate was 1,000,000 gallons per acre per day until December 1 when it was increased to 1,200,000 gallons. The filter was not covered during the winter and was protected only slightly by means of an earth embankment around the tank containing the filtering medium, and also to some extent by the filter house which was nearby and on the northerly side of it.

The monthly averages of analyses of influents and effluents given in Tables LXII and LXIII show the work accomplished by the filter from month to month. The individual analyses upon which these tables are based are tabulated in Appendix L. The influents of this filter differed from those of the other filters principally in the amount of suspended matter contained during the months of August, September, October and November. As has already been explained in the discussion of the results of the experiments upon the septic tank, comparatively large quantities of suspended matter were carried over from that tank to the filters receiving septic effluent whereas the effluent from the settling basin which was applied to this filter carried a nearly uniform amount of suspended matter throughout the experiment, and much less during the summer and fall than did that from the septic tank. It should be mentioned in this connection that the influents to this filter con-

TABLE LXII.

Monthly Averages of Results of Chemical Analyses of Influent, Sprinkling Filter No. 4.

Source of Influent, Settling Tank.

INFLUENT Parts per Million.												
1908-1909 Date	Temperature Deg. F.		Nitrogen			Suspended Matter						
	Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Total	Volatile	Fixed	Nitrites	Nitrates	Dissolved Oxygen
August	...	..	10.0	14.0	47	69	56	13	0.12	0.14	....
September	..	..	9.5	15.0	58	78	62	16	0.08	0.06	....
October	56	54	11.0	14.0	60	72	55	17	0.16	0.12	0.00
November	50	43	12.0	15.0	55	74	57	17	0.38	0.27	0.51
December	48	39	15.0	13.0	57	83	67	16	0.45	0.49	2.80
January	46	41	16.0	11.0	64	79	63	16	0.39	0.99	3.60
February	45	41	16.0	9.1	64	79	67	12	0.23	1.70	4.20
March	44	39	15.0	11.0	57	90	64	26	0.44	1.60	4.60
April	45	45	13.0	9.1	48	80	56	24	0.92	1.50	4.40
May	51	52	17.0	11.0	52	104	70	34	1.30	1.10	3.30
June	59	60	16.0	17.0	55	109	82	27	0.16	0.27	0.55
Weighted Average	50	46	13.0	13.4	57	81	62	19	0.37	0.45	1.98

TABLE LXIII.

Monthly Averages of Results of Chemical Analyses of Effluent of Sprinkling Filter No. 4.

EFFLUENT

Parts per Million.

1908-1909	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Dissolved
	Organic	Ammonia Free	Nitrites	Nitrates		Total	Volatile	Fixed	
August	5.3	11.0	0.91	0.30	30	25	21	4	...
September	2.8	9.6	1.56	2.50	23	17	15	2	...
October	4.2	8.9	1.80	2.70	26	23	18	5	5.2
November	5.6	11.0	0.80	2.00	29	38	29	9	5.9
December	7.3	13.0	0.63	1.10	32	47	40	7	6.1
January	8.6	13.0	0.70	1.00	37	46	37	9	5.6
February	7.8	12.0	0.70	1.10	36	48	40	8	5.2
March	6.5	13.0	0.90	1.00	31	47	36	11	6.6
April	6.8	9.4	1.40	1.10	26	42	35	7	5.9
May	16.0	11.0	1.80	1.00	48	189	128	61	4.6
June	10.0	11.0	1.50	0.50	37	106	78	28	4.1
Weighted Average	6.5	10.2	1.2	1.70	31	49	37	12	5.8

tained a comparatively large amount of suspended matter during May and June, doubtless due as already explained in another place to the accumulation of sludge in the settling basin and consequent inefficiency of the sedimentation process.

The quality of the influent and effluent can be readily compared by the use of the following figures:

	(Parts per Million) Influent.	Effluent.	% Removed.
Organic Nitrogen	13	6.5	50
Free Ammonia	13.4	10.2	27
Oxygen Consumed	57	31	46
Total Suspended Solids	81	49	40
Volatile " "	62	37	40
Fixed " "	19	12	37
Nitrogen as Nitrites	0.37	1.2	224 increase
Nitrogen as Nitrates	0.45	1.7	280 "
Dissolved Oxygen	1.96	5.8	196 "

The purification effected by this filter as shown by the foregoing results of analyses, was sufficient to remove on the whole only about 45% of the impurities of the influent. There was a decided increase in nitrites, nitrates and dissolved oxygen. Monthly averages of analyses showed a gradual deterioration in the quality of the effluent with the advent of cold weather and the filter had not fully recovered from the effect of the winter at the end of June, to which time the analyses have been tabulated. The suspended matter in the effluent increased after October, remaining comparatively stationary until May, after which time there was a marked increase due to the auto-

matic cleaning of the filter. During the first three months of operation, this filter did better work than No. 3, which was built in exactly the same manner. After November, however, the injurious effect of the cold weather, due probably partly to low temperature and partly to inefficient distribution on account of the ice covering, was clearly reflected in the inferior quality of the effluent. This deterioration reached its maximum in March, during which month the effluent was putrescible upon all occasions when it was tested. These tests, however, were made with the full content of suspended matter present. The putrescibility tests indicated a marked improvement in the condition of the filter during April, although there was a slight recession during May. In June the effluent was found to be putrefactive three-quarters of the time. The effect of removing the suspended matter upon the keeping qualities of this effluent is discussed on pages 174 et seq.

Quantity of Suspended Matter Removed by Sprinkling Filters.

It is unfortunate that the experiments with the sprinkling filters could not have been continued for a longer period of time to make it possible to determine what proportion of the suspended matter applied to the filters would be retained in their pores.

Table LXVI shows the number of parts per million of suspended solids in the influents and effluents of sprinkling filters Nos. 1 and 2, and settling basin No. 1, as well as the relation of the suspended matter in the effluent from the settling basin to that in the crude sewage. Table LXVII gives the same data in relation to sprinkling filters Nos. 3 and 4 and settling basin No. 2. The amount of suspended matter in the effluent from the settling basins was equivalent to from 3 to 11% of the quantity present in the crude sewage. The quantity of solids in suspension in the sprinkling filter effluents obtained by the various filters at Lawrence, Mass., and Columbus, Ohio, have been tabulated for the purpose of assisting in the comparison of the quantities in the effluents from the various filters at Gloversville.

	Rate mgd. per acre.	Pounds solids per mil gals.	Parts per per million solids.
Gloversville, N. Y.			
No. 1	1.18	242	29
No. 2	1.06	367	44
No. 3	1.00	309	37
No. 4	1.20	409	49
Lawrence, Mass.			
Filter 135, 1902-5		536	64
" 136, "		906	109
" 135-136, 1906	1.67	845	101
" 233-235, "	1.15	825	99
" 247, "	1.24	1388	166
" 248, "	1.29	1236	148
Columbus, Ohio.			
A	1.33	1045	125
B	1.85	876	105
C	1.78	477	57
D	2.27	535	64
E	1.51	234	28
F	2.28	644	77

From these figures it appears that the Gloversville effluent contained much less suspended matter than that of either Lawrence of Columbus. At

Lawrence the quantities were on the average considerably more than double those at Gloversville. There was little difference in the quantity of suspended matter per million gallons applied to these various filters, although the quantity at Gloversville was on the whole rather greater than at the other places. In spite of this fact the quantity in the effluents was decidedly less at Gloversville, leading to the interesting query whether the filters would automatically unload during the summer. It was not deemed wise to attempt to determine the voids in the filters to throw light upon this question because they have not been shut down and it was feared that flooding and draining might wash out large quantities of suspended matter and thus interfere with the natural unloading process which it was hoped would take place as soon as the sewage reached a comparatively high temperature.

It is not improbable that the low rates at which the Gloversville filters have been operated do not furnish as great assistance in the natural unloading of suspended matter as the higher rates in use at the other cities.

Table LXVIII gives the quantity of solid matter, in parts per million gallons of sewage applied which was removed from the influents by the several filters. It is apparent that filter No. 1 removed a larger quantity of suspended matter than did any of the other filters. Filter No. 3 came next to Filter No. 1 in this respect and removed more suspended matter than did either filters Nos. 2 or 4. As has been stated earlier in this report, there is no apparent reason for the retention of such a large quantity of suspended matter in this filter. Filter No. 2 removed much more solid matter than did No. 4.

From the second part of Table LXVIII it appears that filter No. 1 in no month discharged more suspended matter than it received. The quantity retained or stored in the filter as indicated by amount removed from influent, was largest during the first few months of its operation, reaching 87.6% of that applied in the month of September. There has been a gradual reduction in the percent of solid matter retained in this filter, and it may be that if the experiments could have been continued longer, it would have unloaded some of the matters previously retained. During the month of June the quantity of suspended matter retained was equivalent to only 22% of that applied.

During the month of May the quantity of suspended matter discharged from filters Nos. 2 and 4 was considerably in excess of that applied. In these filters as well as in the case of filter No. 1, there has been a gradual reduction in the proportion of suspended matter retained in the filter to that applied.

Filter No. 3 has, during no month, discharged more suspended matter than it received, and it has not shown a tendency to reduce the relation of the quantity of suspended matter stored to that applied, which has been evident in the other filters.

In Table LXIX are given the quantities of suspended solids assumed to have been stored in the filters, figured in pounds of dried solid matter. In addition are given also the estimated volume occupied by the several quantities of suspended matter stored on the basis of its being dry and in the form of sludge containing 20% and 10% solid matter. From these various calculations it appears that were the filters allowed to dry out so that no moisture was contained in them, from 0.72% to 1.83% of the voids in them would be occupied by the solids which have accumulated. Further, that if the solids are present in the form of sludge as dense as 80% water, the space occupied would vary from 3.60 to 9.15% of the original voids in the filter. Assuming that the solid matter retained by the filter is in the form of sludge containing

90% water, the space occupied by it varies from 7.20% to 18.30% of the original voids in the several filters.

From these various studies it appears that there has been no marked unloading of the matters retained. It is also evident that there is no marked indication that the filters were about to discharge large quantities of suspended matter. On the other hand, there has been a gradual tendency in all of the filters with the possible exception of No. 2, toward reducing the quantity of suspended matter removed from the influent. For convenience, in the foregoing discussion the suspended solids removed from the influents have been assumed to have been retained in the filters. It is not improbable that much of this matter may have disappeared and that it would not appear as an accumulation in the filters if an examination were made.

Loss of Heat of Influent in Passing Through Filters.

The temperatures of influent and effluent of the various filters have been taken daily. All records of temperatures of sewage and effluents are given in Appendix R. The averages of these temperatures show that the effluent lost a small amount of its heat during its passage through the filters. The average loss by months for the various filters was as follows:

	Degree Fahrenheit.			
	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4
November	2	2	2	7
December	1	1	3	9
January	1	1	2	5
February	1	1	2	4
March	1	1	2	5

Note: Filter house completed Nov. 9, 1909.

These averages show that there was a much greater loss in temperature in the case of filter No. 4 which was not protected by the filter house. The average temperatures of the effluents are given in the several tables of monthly averages of results of analyses. From these averages, it appears that the temperature of the effluent of the filters from December to March inclusive, will probably be as low as 40° Fahrenheit, in the case of a filter five feet deep, unprotected from the weather. The effluent from a filter five feet deep will be from 3 to 6° warmer if housed than if unprotected.

Comparison of Results of Experiments with Sprinkling Filters.

To facilitate a comparison of the quality of the various effluents, the following table has been compiled:

TABLE LXIV.

Averages of Results of all Analyses of Effluents from All Sprinkling Filters.

(Parts per Million)

Filter	No. 1	No. 2	No. 3	No. 4	Crude Sewage
Organic Nitrogen	3.5	5.0	5.8	6.5	23.0
Free Ammonia	8.0	8.6	11.4	10.2	12.0
Oxygen Consumed	22.0	27.0	28.0	30.0	95.0
Total Susp. Matter	29.0	44.0	37.0	49.0	406.0
Volatile Susp. Matter	22.0	32.0	29.0	37.0	229.0
Fixed Susp.	7.0	12.0	8.0	12.0	176.0
Nitrites	1.5	1.3	1.4	1.2	0.38
Nitrates	4.8	3.6	1.6	1.7	0.87
Dissolved Oxygen	6.4	5.6	4.8	5.8	2.32

There is a gradual increase in the amount of organic nitrogeu in the effluents from Filters Nos. 1 to 4. There is considerably more free ammonia in the effluents from Filters Nos. 3 and 4 than those from Filters Nos. 1 and 2. The oxygen consumed and the total suspended matter are both much higher in the filtrate from No. 4, than in the other effluents. There is a corresponding reduction in the amount of nitrates which is less than one-half as high in the effluents from the 5-foot beds as from those of the 7 and 10-foot beds. Dissolved oxygen is present to a marked extent in all of the filters, and during the winter and spring, the effluents were nearly one-half saturated with oxygen.

Table LXV shows the percentage of samples of the various effluents from the sprinkling filters and settling basins which were found to be putrescible after incubation during 48 hours at 37° centigrade. The tests of the filter effluents were made without the removal of any of the suspended matter. The effluents from the settling basins showed to some extent the effect of removing a portion of the suspended matter of the filter effluent.

TABLE LXV.

Proportion of All Samples Taken from the Sprinkling Filters and Settling Basins that were Putrescible.

(Incubation Period—48 hours at 37°.)

Month	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4	°Settling Basin No. 1	*Settling Basin No. 2
September, 1908	5	0	50	15	....	....
October, 1908	4	0	86	48	0	18
November, 1908	0	54	83	77	4	29
December, 1908	7	33	25	82	7	65
January, 1909	20	53	53	87	27	33
February, 1909	21	79	78	78	36	0
March, 1909	14	79	62	100	14	6
°°April, 1909	7	25	7	86	0	0
May, 1909	13	93	60	93	20	0
June, 1909	18	55	67	75	14	0
Weighted Average	9.3	47.1	62.7	75.4	13.0	19.1

°°Samples were tested every day after April 1, 1909.

*Basin cleaned Dec. 12, Feb'y 2 and May 18.

°Basin cleaned Dec. 2, Mar. 18, May 12 and 27 and June 16.

TABLE LXVI.

Quantity of Suspended Matter in Influents and Effluents of Sprinkling Filters, Nos. 1 and 2 and Settling Basin No. 1.

	Sprinkling Filter No. 1. Parts per Mil.		Sprinkling Filter No. 2. Parts per Mil.		Settling Basin No. 1		
					Parts per Mil.		Per cent. suspended matter in Effluent ref. to that in Crude Sewage.
	Influent	Effluent	Influent	Effluent	Influent	Effluent	
August, 1908	122	21	...	...	...	..	..
September, 1908 ...	105	13	113	14	12	11	3
October, 1908	125	21	142	15	18	12	3
November, 1908	125	22	124	35	29	16	4
December, 1908	83	30	83	57	44	28	9
January, 1909	90	33	90	47	40	28	8
February, 1909	86	27	86	46	37	31	7
March, 1909	89	30	89	44	37	29	11
April, 1909	83	45	81	46	45	26	7
May, 1909	114	70	114	202	136	46	9
June, 1909	95	74	95	86	80	28	5

TABLE LXVII.

Quantity of Suspended Matter in Influents and Effluents of Sprinkling Filters.

Nos. 3 and 4 and Settling Basin No. 2.

	Sprinkling Filter No. 3. Parts per Mil.		Sprinkling Filter No. 4. Parts per Mil.		Settling Basin No. 2.		
					Parts per Mil.		Per cent. suspended matter in Effluent ref. to that in Crude Sewage.
	Influent	Effluent	Influent	Effluent	Influent	Effluent	
August, 1908	85	27	69	25	..	..	..
September, 1908 ...	112	35	78	17	32	17	5
October, 1908	138	28	72	23	24	15	4
November, 1908	131	32	74	38	36	20	5
December, 1908	86	29	83	47	41	30	10
January, 1909	84	37	79	46	42	27	8
February, 1909	86	62	79	48	50	24	5
March, 1909	90	44	90	47	46	28	10
April, 1909	86	25	80	42	33	18	5
May, 1909	110	55	104	189	122	27	5
June, 1909	117	62	109	106	77	26	5

TABLE LXVIII.

Quantity of Suspended Matter Retained in Filters.

Parts per million.

Month.	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4
August, 1908	101	...	58	44
September, 1908	92	99	77	61
October, 1908	104	127	110	49
November, 1908	103	89	99	36
December, 1908	53	26	57	36
January, 1909	57	43	47	33
February, 1909	59	40	24	31
March, 1909	59	45	46	43
April, 1909	38	35	61	38
May, 1909	44	−88	55	−85
June, 1909	21	9	55	3
Average	66.5	43.1	62.6	27.2
From Monthly Averages	78	76	74	32

Per cent. of that in Influent.

Month.	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4
August, 1908	82.8	.....	68.3	63.8
September, 1908	87.6	87.6	68.7	78.2
October, 1908	83.2	89.4	79.7	68.0
November, 1908	82.4	71.7	75.6	48.7
December, 1908	63.9	31.3	66.3	43.4
January, 1909	63.4	47.8	56.0	41.8
February, 1909	68.6	46.5	27.7	39.2
March, 1909	66.3	50.6	51.1	47.8
April, 1909	45.8	43.2	70.9	47.5
May, 1909	38.6	−77.2	50.0	−81.6
June, 1909	22.1	9.5	47.0	2.8
Average	64.1	40.8	60.2	37.2
From Monthly Averages	72.8	63.3	66.6	39.5

TABLE LXIX.

Quantity and Volume of Suspended Matter.

Retained in Filters.

Month.	Total pounds dry solids. Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4	
August, 1908	11.9		2.6	2.8	
September	41.6	48 2	34.8	29.1	
October	56.8	76.2	52.5	27.7	
November	77.4	66.7	74.5	27.0	
December	48.3	21.4	44.4	33.7	
January, 1909	51.9	35.6	36.6	30.9	
February	48.4	29 8	16.9	26.2	
March	53.8	37 3	35.8	40.0	
April	33.4	28.1	45.9	34.3	
May	40.2	—72.9	42.8	—79.0	
June	18.5	7.2	41.4	2.7	
Total (lbs.)	482.2	277.6	428.2	175.4	Dry Solids
Total cu. ft. (75# per cu. ft.)	6.45	3.7	5.7	2.3	Dry Solids
Total cu. ft. (10% solid)	64.5	37.0	57.0	23.0	90% Water
Total cu. ft. (20% solid)	32.3	18.5	28.5	11.5	80% Water
Per cent. voids filled	1.05	0 86	1.83	0.72	Dry Solids
Per cent. vo'ds filled	5 25	4.30	9.15	3.60	80% Water
Per cent. voids filled	10.50	8.60	18.30	7.20	90% Water

These basins, however, might be made more effective by improved design and greater care to prevent the accumulation and putrefaction of sludge during the warmer weather.

The work accomplished by Filter No. 1, was far better than that of any of the others and the effluent was better even than the effluent from settling basin No. 1, which received the effluents from Filters Nos. 1 and 2 combined in equal portions.

Filter No. 2 did, on the whole, rather better work than Filter No. 3, but did not approach the results obtained by No. 1. By passing the effluents from Filters Nos. 1 and 2, through Settling Basin No. 1, considerable suspended matter was removed with the result that the effluent from the settling basin was putrefactive on less than a quarter of the number of days upon which the effluent from Filter No. 2 was found to be putrefactive. The effluent from the settling bason, however, was putrefactive a greater portion of the time than was the effluent from Filter No. 1.

There was comparatively little difference in the quality of the effluents of Filters Nos. 3 and 4. During the fall, No. 3 did poorer work than No. 4, which may have been due in part at least to the clogging. During the winter No. 4 showed to a marked extent the effect of its exposed position and did not turn out an effluent nearly as good as that from No. 3. The effluents from Filters 3 and 4, after passing through settling basin No. 2, were found to be in excellent condition after January, none of the samples being found putrescible during February, April, May and June, while only 6% were found putrescible during the month of March. The comparatively large proportion of samples which were putrescible during November, December and January, may have been due to the inferior quality of the effluent from Filter No. 3, or to the lack of sufficient cleaning of Settling Basin No. 2.

In considering the putrescibility tests, due weight should be given to the

fact that the methylene blue test is very delicate; that tests have been carried out at 37° Centigrade, a temperature which is far above that which will ever be reached by the water into which the sewage effluents will be dischargd; that the tests have been made upon filter effluents containing all of their suspended matter; and that the tests of the basin effluents have been made upon the undiluted samples of the effluent. In other words, these tests have been of a most exacting nature and have been applied as though the creek were made up entirely of sewage effluents, no allowance having been made in the tests for the dilution which will be furnished by the natural waters of tne creek.

In general, it may be stated that there was a reduction in the quality of the effluents from the filters, corresponding to the diminished depth of filtering material. It is probable that with the entire flow of sewage treated in the same manner as the sewage applied to Filter No. 1, no offensive odors would be caused by its discharge into Cayadutta Creek.

The quality of the effluent from Filter No. 2 would indicate that if the entire flow of sewage were purified to the same degree as this effluent, it would probably be necessary to pass the resulting effluent through settling basins to remove the suspended matter before its discharge into the creek.

The work of Filters Nos. 3 and 4 did not indicate that there was any advantage in passing the sewage through the septic tank, rather than through the settling tank before applying it to the filters. Further it appears that a a filter unprotected from the cold and storms of the winter will not do as good work as a similar filter protected by a building, although such building need not be artificially heated. If the entire flow of sewage should be treated in the same way as that which ultimately passed out of Filters Nos. 3 and 4, it would be necessary to remove a large proportion of the suspended matters in the effluent before its discharge into Cayadutta Creek to avoid causing offensive odors.

Results of Experiments with Settling of Sprinkling Filter Effluents.

Two settling basins were constructed as already described and received the effluents from Sprinkling Filters Nos. 1 and 2, and Nos. 3 and 4 respectively. The rate of flow through basin No. 1 was such that until October 23 it received a quantity equal to its cubic capacity once every 2.7 hours, and after October 23 once every 1½ hours. The rate of flow through basin No. 2 was such until October 23 that it received a quantity equivalent to its cubic capacity once every ten hours and after October 23 once every 5.6 hours.

The sludge which accumulated in these basins was removed several times, but the operation of the basins would doubtless have been more efficient had it been removed at shorter intervals especially during the warmer portions of the year.

The monthly averages of results of analyses of influents and effluents of basin No. 1 appear in Table LXX. The individual analyses upon which this table is based are given in Appendix M. These analyses indicate that at certain times, there was an increase in Free Ammonia during the passage of the effluent through the basin, even though the period of flow was very short. There was also a slight decrease in the quantity of Nitrites and Nitrates tending also to show that there was some bacterial action going on in the effluent, or the suspended matter which had accumulated on the bottom and the sides of the basin, which tended to cause putrefaction, and to reduce the keeping qualities of the water.

TABLE LXX.

Monthly Averages of Results of Chemical Analyses of Influent and Effluent of Settling Basin No. 1

Source of Influent: Filters Nos. 1 and 2. Period of Flow Through Settling Basin .... Hours.

1908-1909 Date	Influent: Temperature Deg. F. Influent	Influent: Temperature Deg. F. Effluent	Influent: Parts per million, Nitrogen: Organic	Influent: Nitrogen: Free Ammonia	Influent: Nitrogen: Nitrites	Influent: Nitrogen: Nitrates	Influent: Oxygen Consumed	Influent: Volatile Matter	Influent: Suspended Matter	Influent: Oxygen Dissolved	Influent: Oxygen Consumed 5 min. Cold test	Effluent: Parts per Million, Nitrogen: Organic	Effluent: Nitrogen: Free Ammonia	Effluent: Nitrogen: Nitrites	Effluent: Nitrogen: Nitrates	Effluent: Oxygen Consumed	Effluent: Volatile Matter	Effluent: Suspended Matter	Effluent: Oxygen Dissolved	Effluent: Oxygen Consumed 5 min. Cold test
September	..	..	1.8	6.9	1.6	6.0	21	10	12	...	...	1.7	7.3	1.7	6.0	22	9	11	...	...
October	54	54	2.1	6.0	1.61	6.4	20	12	18	6.9	...	2.1	6.2	1.9	5.9	19	10	12	6.2	...
November	49	49	3.9	8.8	1.0	4.5	23	21	29	5.5	...	2.8	9.1	1.0	3.9	21	13	16	4.6	...
December	47	47	5.7	9.4	1.1	3.6	26	36	44	6.7	6.6	4.7	10.4	0.97	3.6	23	24	28	6.6	6.1
January	45	45	5.4	11.0	1.6	2.1	30	33	40	6.5	7.9	5.4	12.0	1.30	2.2	28	25	28	6.1	7.8
February	45	44	5.5	11.0	1.3	2.4	30	32	37	6.1	7.8	4.4	12.0	1.30	2.8	28	27	31	6.8	7.6
March	43	43	5.7	10.1	1.4	2.5	28	31	37	6.4	6.6	4.6	10.0	1.60	2.4	26	25	29	6.9	6.0
April	45	45	4.3	7.4	1.6	3.3	24	36	45	6.6	...	2.9	7.0	1.50	3.5	20	21	26	7.4	...
May	53	53	10.0	7.5	1.8	2.8	36	77	136	5.5	8.4	5.3	7.6	1.80	2.8	23	35	46	5.8	4.7
June	60	60	6.7	7.0	1.9	4.2	30	55	80	5.5	6.0	3.6	7.2	1.80	4.4	20	21	28	5.7	3.7
Weighted Average	50	50	4.2	8.0	1.4	4.5	24	26	37	6.2	7.0	3.2	8.3	1.5	4.3	22	17	21	6.0	5.9

Further evidence in this line is furnished by the examination of Oxygen Dissolved, the quantity of which was generally somewhat decreased during the time that the water remained in the basin. The length of time consumed by the passage of water through this basin was so small that usually there was no noticeable reduction in temperature. During the very coldest weather in February, the temperature of the effluent was only one degree below that of the influent, and in all other months the temperature was the same.

By far the most important change taking place in the effluent during its sedimentation was the removal of suspended matter. This is shown clearly by the following tabulation of monthly averages of the quantity of suspended matter in the influent and effluent, together with the percent removed.

TABLE LXXI.

Suspended Matter, Settling Basin No. 1.
Influent Composed of Equal Portions of Effluent from Sprinkling Filters Nos. 1 and 2.

(Parts per Million).

Date.	Influent.	Effluent.	% Removed.
September	12	11	8
October	18	12	34
November	29	16	45
December	44	28	36
January	40	28	30
February	37	31	16
March	37	29	22
April	45	26	42
May	136	46	66
June	80	28	65
Average	37	21	43

It is interesting to note that only on two occasions did the suspended matter in the effluent exceed thirty parts, in one case reaching thirty-one parts and in the other forty-six parts. During the month of May the influent averaged 136 parts suspended matter and 66% was removed. The efficiency of the tank as measured by the percent removed naturally varied according to the quantity of suspended matter in the influent, but the comparatively uniform quantity in the effluent indicates that by this method even with a very short period of sedimentation the suspended matter can be reduced to 30 parts, or perhaps less, per million.

That the suspended matter is of a nature which is readily removed by sedimentation, is indicated by the fact that as much as 43% on an average, and as high as 66% during a single month, was removed by sedimentation when the rate of flow through the tank was equivalent to a period of 1.5 hours.

Settling Basin No. 2.

This basin was designed to show what results would be obtained by a fairly long period of sedimentation. The effluent from Filters Nos. 3 and 4 contained a larger quantity of suspended matter than that from Filters Nos. 1 and 2, consequently somewhat more work devolved upon this basin than upon basin No. 1. The monthly averages of analyses of influent and effluent of this basin are given in Table LXXII. The individual analyses on which this table is based, are given in Appendix N.

As in the case of basin No. 1, the Free Ammonia in the effluent is higher than that in the influent, and the Nitrites, Nitrates and Oxygen Dissolved present in the influent were reduced. These facts indicate that there was considerable bacterial action in the water, or the accumulated sludge, which did reduce the keeping qualities of the effluent.

During the colder weather there was generally a reduction in the temprature of the water during its passage through the tank, amounting to from 1 to 2° on the average. It should be mentioned in this connection that this tank was wholly above the surface of the ground and, therefore, entirely sur-

TABLE LXXII.

Monthly Averages of Results of Chemical Analyses of Influent and Effluent of Settling Basin No. 2.

Source of Influent: Filters 3 and 4.

1908 & 1909 Date	Influent: Temperature Deg. F. Influent	Influent: Temperature Deg. F. Effluent	Influent: Parts per Million, Nitrogen: Organic	Influent: Nitrogen: Free Ammonia	Influent: Nitrogen: Nitrites	Influent: Nitrogen: Nitrates	Influent: Oxygen Consumed	Influent: Volatile Matter	Influent: Suspended Matter	Influent: Oxygen Dissolved	Influent: Oxygen Consumed 5 min. Cold test	Effluent: Parts per Million, Nitrogen: Organic	Effluent: Nitrogen: Free Ammonia	Effluent: Nitrogen: Nitrites	Effluent: Nitrogen: Nitrates	Effluent: Oxygen Consumed	Effluent: Volatile Matter	Effluent: Suspended Matter	Effluent: Oxygen Dissolved	Effluent: Oxygen Consumed 5 min. Cold test
September	..	..	4.5	10.4	1.9	4.0	28	23	32	...	....	2.8	11.0	1.6	1.1	25	14	17	..	...
October	54	53	4.3	9.6	1.7	2.4	25	18	21	...	....	3.3	11.0	1.1	1.1	23	12	15	..	...
November	46	45	5.6	12.0	0.9	1.7	29	28	36	5.2	....	4.4	13.0	0.7	1.3	25	17	20	3.7	...
December	43	42	8.0	12.0	0.85	1.4	32	34	41	5.6	10.0	6.1	13.0	0.73	0.99	27	27	30	4.2	8.4
January	42	42	7.6	13.0	1.00	1.5	34	34	42	5.5	9.7	6.5	14.0	0.90	0.97	30	23	27	4.4	9.0
February	45	41	6.4	11.0	0.82	2.4	33	42	50	6.1	9.1	5.9	11.0	0.83	1.30	26	22	24	6.8	7.2
March	44	41	6.1	13.0	1.10	1.20	30	35	46	...	8.2	5.7	12.0	1.00	1.10	26	26	28	6.5	6.7
April	45	45	5.7	9.6	1.50	1.60	24	27	33	6.6	....	4.5	9.5	1.30	1.20	20	16	18	5.9	...
May	52	52	12.0	10.0	1.90	1.4	38	85	122	5.0	8.8	4.9	9.7	1.70	1.40	22	23	27	5.3	4.6
June	61	61	8.1	11.0	1.40	0.5	35	63	77	3.4	8.5	5.2	11.0	1.50	0.20	24	23	26	3.6	5.0
Average.........	49	48	6.1	11.1	1.35	2.1	30	33	43	5.2	9.0	4.4	12.0	1.1	1.1	24	18	21	4.6	6.9

rounded by the air of the filter house and fully exposed to the effect of the temperatures obtaining in this building, while basin No. 1 was buried in the ground, although the surface of the water was exposed to the air.

The efficiency of this basin as an agency for removing the suspended matter of the influents, is clearly indicated by the following tabulation:

TABLE LXXIII.

Suspended Matter, Settling Basin No. 2.

Influent Composed of Equal Portions of Effluent from Sprinkling Filters Nos. 3 and 4. (Parts per Million).

Date.	Influent.	Effluent.	% Removed.
September	32	17	47
October	24	15	38
November	36	20	45
December	41	30	27
January	42	27	36
February	50	24	52
March	46	28	39
April	33	18	46
May	122	27	78
June	77	26	66
Average	43	21	51

It is important to note that while on occasional days in several months the suspended matter was above 30 and even on a few occasions above 40 parts, on the average in no month did it exceed 30 parts. It is clear that with careful attention to cleaning, the suspended matter could have been reduced at all times to at most 30 parts per million. The proportion of the suspended matter of the influent which was removed varied naturally with the quantity present in the influent and reached as high on the average for a whole month as 78%, and on occasional days as high as 80 or 85%. The general results of sedimentation in this tank were superior to those of tank No. 1, even though the influent contained at nearly all times a large amount of suspended matter.

The effluent from basin No. 2 was somewhat superior to that from basin No. 1 as measured by the putrescibility test. After January, the effluents from Sprinkling Filters Nos. 3 and 4 were usually putrescible at least two-thirds of the time, but the effluent from basin No. 2 was non-putrescible substantially all of the time.

Many samples of the effluents from the various filters were filtered through filter paper and through cotton. Those filtered through paper were uniformly of a character which would successfully pass the putrescibiltyi test, while some of those filtered through the cotton failed to pass. These tests indicate that the effluents from the sprinkling filters were on many occasions very close to the danger line and that it would be absolutely necessary to provide for the removal of a large proportion of the suspended matter, if they were to satisfactorily pass the putrescibility test as applied. In this connection it is again necessary to point out the fact that these tests were made by a very delicate method at temperatures far in excess of those obtained in the creek, and for a long period of time, and upon the undiluted effluents. In other words, these tests were of the severest character and much more exacting than the practical working conditions under which the final plant must be operated.

As a result of the various experiments it seems to have been proved that it is possible to treat the effluents either from septic or sedimentation tanks by means of sprinkling filters of from 5 to 10 feet in depth and of a size of stone similar to that used in this experiment, at a net rate of one million gallons per acre per day, and produce effluents which will satisfactorily withstand the most exacting tests for putrescibility, after they have passed through sedimentation basins in which the quantity of suspended matter has been reduced to 30 parts per millicn.

SLUDGE FROM SETTLING TANKS.

The suspended matter in the effluents from the sprnkling fiiters, although comparatively finely divided, is more or less flocculent in nature and settles rapidly.

The sludge resulting from the sedimentation of the filter effleunts was comparatively light, containing on the average not over 7% of solid matter. It was biack in color and always possessed a characteristic odor, although under the conditions of operation the odor developed was not of a highly putrescible or offensive character.

When the sludge was allowed to accumulate to a considerable depth, it was occasionally brought to the surface by the gas entrained in it. The quantity of gas produced by this sludge appeared to be considerably less than from a corresponding amount of sludge in septic tanks receiving domestic sewage.

Great numbers of mosquito eggs were deposited in the settling basins and particularly in the coating of sludge which adhered to the sides of the basins. At favorable times these were hatched and myriads of larvae were found wiggling about the sides of the tanks. These in time developed into full grown mosquitoes which appeared in vast numbers, even throughout the winter. It is interesting to note that so far as the observation of the attendants went, these mosquitoes were not inclined to bite. The application of a film of oil to the surface of the tanks was effective in killing the larvae. The only trouble caused by these insects was the occasional falling to the bottom of accumulations of suspended matter on the sides of the tank, carrying with them large quantities of the wiggling insects, The motion of these insects in the sludge appeared to cause the necessary breaking up of the mass to permit of its being carried to the surface of the tank by the entrained gas, so that at times the entire tank was a mass of floating and suspended sludge containing more or less gas bubbles and large quantities of insects.

The quantity and character of sludge collected by and removed from Settling Basin No. 1, is shown by Table LXXIV.

The quantity produced varied greatly, being the highest, as would be expected, during the periods when the filters were freeing themselves from accumulated suspended matter in the spring of the year. During the period from May 27 to June 16, the quantity of sludge produced amounted to 6.6 cubic yards, or 1.05% of the flow through the basin.

The density of the sludge was quite uniform throughout the experiment, ranging from 94 to 95% water.

It is interesting to note that this sludge contains a comparatively large quantity of nitrogen, amounting to nearly twice as much as was found in the sludge from the septic tank or settling tank.

The quantity and character of sludge collected by and removed from Settling Basin No. 2, are recorded in Table LXXV.

The quantity of sludge produced by this basin was slightly greater than that produced by No. 1. The density of the sludge was just about the same as that in basin No. 1, ranging from 94 to 96% water.

The nitrogen varied from 4.7 to 6.3% of the dry sludge, being approximately the same proportion as in the sludge removed from basin No. 1, and fully twice as high in amount as the sludge from either the septic or settling tanks.

TABLE LXXIV.

Quantity and Character of Sludge Deposited in the Settling Basin No. 1.

(Receiving Effluents from Sprinkling Filters Nos. 1 and 2.)

Settling Basin No. 1	Total Gallons of Sewage Treated.	Av. Period of Flow (Hours).	Per Million Gallons. Sludge Deposited					Per cent. Nitrogen Figured on Terms of Dry Solids.	Per cent. Fats Figured in Terms of Dry Solids.
					TONS.				
						Dry Solids			
			Cubic Yards.	Per cent. water.	Wet Sludge.	Total.	Volatile.		
Sept. 1, '08, to Dec. 2, '08.	467,760	2.1	1.2	94	1.03	.062	.038	4.5	4.2
Dec. 3, '08, to March 18, '08.	705,600	1.5	1.2	95	1.03	.052	.034	5.2	3.5
March 18 to May 12, '09...	379,600	1.5	3.2	95	2.8	0.14	0.09	5.1	2.3
May 12, to May 27, '09....	178,440	1.5	4.0	95	3.5	0.18	0.10	5.0	2.0
May 27 to June 16, '09....	127,680	1.5	6.6	94	5.7	0.34	0.12	Not analyzed for fats and nitrogen.	
Weighted Average			2.25		1.95	0.11	0.05		

TABLE LXXV.

Quantity and Character of Sludge Deposited in the Settling Basin No. 2.

(Receiving Effluent from Sprinkling Filters Nos. 3 and 4.)

Settling Basin No. 2	Total Gallons of Sewage treated during the Period.	Average Period of Flow (Hours).	Sludge Deposited Per Million Gallons.					Per cent. Nitrogen Figured in Terms of Dry Solids.	Per cent. Fats Figured in Terms of Dry Solids.
					TONS				
						Dry solids			
			Cubic Yards.	Per cent. Water	Wet Sludge	Total.	Volatile.		
Sept. 1 to Dec. 12, '08.....	528.840	7.5	1.4	96	1.19	.048	.033	4.7	2.7
Dec. 12, '08, to Feb. 2, '09.	343.200	5.6	1.5	96	1.28	.052	.039	6.3	6.3
Feb. 2 to May 18, '09.....	693.000	5.6	3.6	95	3.1	0.16	0.10	5.0	4.2
May 18 to June 18, '09....	204.600	5.6	7.3	94	6.3	0.38	0.25	5.4	2.9
Weighted Average........	....	...	2.97	..	2.25	0.13	0.09	...	...

From the experiments with these two basins, it appears that the quantity of sludge which can be removed from the effluent from the sprinkling filters by sedimentation would amount to about 2½ cubic yards per million gallons of sewage treated. This sludge will be easily pumped and comparatively easy to dispose of, and if removed at frequent intervals, will not have a particularly offensive odor. It is not to be expected, however, that if it is allowed to collect and decompose in large masses, it will be free from such odors and it might under such conditions, be as difficult to dispose of as the sludge from either the septic treatment or sedimentation of crude sewage.

Quantity of Sludge Produced by Sedimentation of Sprinkling Filter Effluents at Various Places.

The quantity of sludge resulting from the sedimentation of sprinkling filter effluents at Gloversville, Lawrence, and Columbus, is given in Table LXXVI.

TABLE LXXVI.

Quantity of Sludge produced by Sedimentation of Sprinkling Filter Effluents at Various Places.

	Period of Sedimentation. (Hours.)	Dry Solids. Lbs. per mil. gallons sewage.	Actual Sludge cu. yds. per million gals. sewage.	Sludge calc. to 90 per ct. water cu. yds. per mil. gals. sewage.
Gloversville.				
Bas'n No. 1	1.5	220	2.25	1.23
Bas'n No. 2	5.6	260	2.97	1.45
Lawrence, Mass.				
From Filters Nos. 135-136	2 to	635		3.55
Nos. 233-235	6 hrs.	652		3.64
No. 247		853		4.77
No. 248		769		4.30
Columbus, Ohio.			90% actual	
Tank D	1.08	493	3.4	2.75
" E	0.77	318	1.5	1.78
" F	0.77	335	2.0	1.87

Much less solid matter was collected in the settling basins at Gloversville than at Columbus. This was due in part of course to the smaller quantity of suspended matter in the influents at Gloversville. The quantity collected at Lawrence was between two and three times as much as at Gloversville.

RESULTS OF EXPERIMENTS WITH SAND FILTER NO 1.

A portion of the effluent from Settling Basin No. 2, was applied to a sand filter five feet in depth. This filter was composed, as already described, of very coarse sand. The sewage was applied at the following net rates per acre per day:

From	September 12 to November 1	300,000 gallons
"	November 1 to December 1	363,000 "
"	December 1 to February 1	550,000 "
"	February 1 to April 1	800,000 "
"	April 1 to July 1	1,000,000 "

During the earlier part of the experiment the distribution of the influent over the surface of the sand was far from uniform. On December 22, a system of zinc troughs was installed, the individual troughs radiating from the center of the tank. The influent was fed into a common cylinder located at the center of the tank, with which all of the troughs connected. In this way the influent was distributed comparatively uniformly over the surface of the sand.

Comparatively little trouble was experienced with the clogging of the sand, it having been necessary to rake the surface but two or three times during the life of the filter. Nothing was removed from the surface of this filter. The filter was dosed during a period of about two hours in the forenoon and three hours in the afternoon on six days in the week. The water applied to the filter at these times of day was found to be as highly polluted as any coming from the settling basin.

The monthly averages of analyses of influent and effluent are given in Table LXXVII. The individual analyses upon which this table is based are given in Appendix O.

It appears from these analyses that there was a gradual increase in the strength of the influent during the few months of operation, during which time also there was a gradual increase in the quantity of water applied to the filters. The effluent on the other hand, did not show a marked increase in the quantity of impurities which it contained, although during March, April and May the organic nitrogen was rather high. In the month of June, however, the organic nitrogen dropped nearly as low as at any time. The analyses indicate that the filter has done its work efficiently even at the highest rates, the effluent for the month of June being practically as good as that obtained at any time since the filter was started.

The purification effected by the filter appears to have been about 60% calculated on the influent as shown from the following figures:

	(Parts per Million) Influent.	Effluent.	% Removed.
Organic Nitrogen	3.9	0.96	76
Free Ammonia	10.5	4.4	58
Oxygen Consumed	21.	11.	48

The effluent from this filter was as highly purified as the various processes employed were capable of.

Calculated upon the constituents of the crude sewage, it appears that the purification may be conservatively placed at about 90%, as shown from the following figures; page 188.

TABLE LXXVII.

Monthly Averages of Results of Chemical Analyses of Influent and Effluent of Intermittent Sand Filter No. 1, Preparatory Treatment Received by Influent.

Sedimentation, Sprinkling Filters, and Secondary Sedimentation.

Parts per Million.

1908-1909	Temperature Deg. F.		Influent				Effluent					
			Nitrogen				Nitrogen					
Date	Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved
October	59	53	2.7	9.8	20	...	1.0[illegible]	3.4	0.7[illegible]	6.5	12	6.9
November	..	..	3.1	12	21	...	0.9	7.1	0.40	3.0	11	8.0
December	41	41	4.0	11	20	...	0.65	5.2	0.78	5.5	11	8.3
January	42	41	3.4	12	25	5.6	0.5	4.3	1.5	11.0	11	6.5
February	44	40	6.4	12	26	...	0.88	4.6	2.4	6.7	13	7.5
March	42	40	4.9	11	22	...	1.2	6.2	3.3	6.4	11	9.0
April	45	44	4.3	9.0	18	...	1.8	5.2	3.5	3.0	11	9.5
May	51	50	5.7	9.1	21	5.1	1.1	3.6	3.6	4.5	12	7.9
June	60	60	5.1	11	22	4.4	0.67	2.7	0.7	11.3	10	3.9
Weighted Average	51	48	3.9	10.5	21	5.0	0.96	4.4	1.5	6.4	11	8.0

	Parts per Million. Crude Sewage.	Effluent.	% Removed.
Organic Nitrogen	23	0.96	96
Free Ammonia	12	4.4	63
Oxygen Consumed	95	11.	88
Suspended Matter	406	0.	100

RESULTS OF EXPERIMENTS WITH SAND FILTER NO 2.

This filter although somewhat smaller in area than No. 1 was composed of sand of the same quality and size, and was 5 feet in depth. Crude sewage was applied at the rate of 100,000 gallons per acre per day. During the first two months of operation of the filter very little trouble was caused by clogging. After that time, however, it was necessary to rake the surface of the filter at frequent intervals and also to remove more or less of the clogged sand. While this filter produced high nitrification and a fairly good quality of effluent during the few months in which it was operated, it became almost impossible to continue the operation on account of the large accumulation of foreign matters on the surface of the filter, and the almost constant necessity for surface raking and cleaning. The monthly averages of results of the analyses of influent and effluent appear in Table LXXVIII. The individual analyses upon which this table is based are given in Appendix P.

The oxygen consumed as determined in the effluent indicated a gradual deterioration in quality, as did also the nitrates and free ammonia.

These experiments demonstrated that a sand filter was capable of purifying sewage of the quality applied but that it was impracticable to use such

a filter without first removing the suspended matter. It was also evident that a rate of 100,000 gallons per acre per day could not be maintained without a reduction in the degree of purification obtained at first.

TABLE LXXVIII.

Monthly Averages of Results of Chemical Analyses of Influent and Effluent of Intermittent Sand Filter No. 2. Unsettled Crude Sewage.

Preparatory Treatment Received by Influent.

Parts per Million.

Date 1908-1909	Influent			Effluent				
	Nitrogen			Nitrogen				
	Organic	Free Ammonia	Oxygen Consumed	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed
September	..	..	...	1.3	1.3	0.75	8.5	12
October	..	..	...	1.05	0.76	1.25	26.0	13
November	29	22	93	2.20	4.7	0.76	26.0	15
December	41	18	120	0.56	5.0	0.36	27.0	14
January	42	15	125	0.95	6.1	0.15	21.0	16
February	31	13	124	1 20	7.1	0.38	20.0	18
Average	35	17	115	1.23	3.1	0.78	21.	14

NUMBER BACTERIA IN SEWAGE AND IN VARIOUS EFFLUENTS.

The limitations of the work at the experiment station were such that it was not possible to make a prolonged bacterial investigation of the sewage and various effluents. A few demonstrations were made from time to time, however, and give a general idea of the total number of bacteria present in the various influents and effluents. The averages of these results were tabulated as follows:

	Number per c. c.
Crude sewage	1,600,000
Septic Tank effluent	5,000,000
Settling Tank effluent	2,000,000
Sprinkling Filter No. 1 effluent	300,000
" " " 2 "	390,000
" " " 3 "	680,000
" " " 4 "	900,000
Settling Basin No. 1 effluent	770,000
" " " 2 "	1,000,000

The results of these determinations indicate that there are present in the sewage at all times, a moderate number of bacteria and that the number is increased greatly during its passage through the septic tank. The increase in the settling tank is much less than in the septic tank, the number in the effluent not being greatly in excess of the number present in the crude sewage. The number present in the effluents from the filters increased gradually from 300,000 in the effluent from No. 1 to 900,000 in the effluent from No. 4.

There is a marked increase in the number of bacteria in the effluents from the shallow filters over those from the deeper ones. There was a marked increase in the number of bacteria during the passage of the water through Settling Basins Nos. 1 and 2, as would be expected, the effluent from basin No. 2 containing by far the larger number of bacteria.

COMPARISON OF CRUDE SEWAGE WITH EFFLUENTS FROM VARIOUS PROCESSES OF PURIFICATION.

To assist in comparing the quality of the various effluents with that of the crude sewage, Table LXXIX has been prepared, using the averages of all results of the analyses of the sewage and several effluents.

TABLE LXXIX.

Quality of Effluents from Various Treatments.

(Parts per Million)

	Organic Nitrogen.	Nitrogen as Free Ammonia.	Oxygen Consumed	Total Susp. Matter.	Nitrogen as Nitrites.	Nitrogen as Nitrates.
Crude Sewage	23	12	95	406	0.38	0.87
Settling Tank	13	13	57	81	0.32	0.55
Septic Tank	13	14	58	100	0.29	0.59
Sprnklg. Fil. No. 1	3.5	8	22	29	1.50	4.80
Sprnklg. Fil. No. 2	5.	8.6	27	44	1.30	3.60
Sprnklg. Fil. No. 3	5.8	11	28	37	1.40	1.60
Sprnklg. Fil. No. 4	6.5	11	31	49	1.20	1.70
Set. Basin No. 1	3.2	8.3	22	21	1.45	4.30
Set. Basin No. 2	4.4	12	24	21	1.10	1.10
Sand Filter No. 1	0.96	4.4	11	00	1.50	6.40
Sand Filter No. 2	1.2	3.1	14	00	0.78	21.00

It is interesting to note the gradual improvements in the character of the sewage as it passes from stage to stage in the process of purification. It is also significant that the effluent produced by Sand Filter No. 2, without any preliminary treatment whatever, was nearly as good as that produced by Sand Filter No. 1, preceded by treatment in the tanks, sprinkling filters and settling basins. On the other hand, it must be remembered that the quantity of sewage which can be filtered in this way per unit of area, is very small, and that the labor of maintaining the surface of the filter in suitable condition, would be almost if not quite prohibitive. It is also probable that the severe winter season usual in this vicinity would cause serious difficulty in keeping the filters in operation.

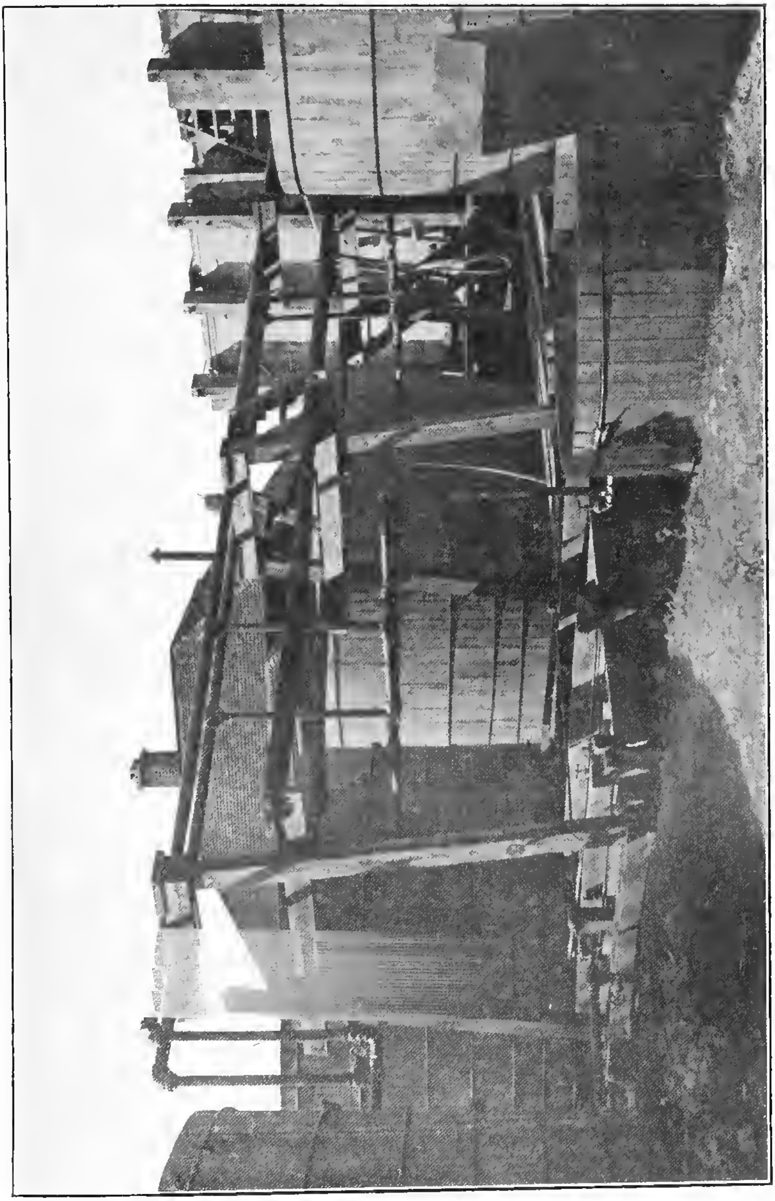
ACKNOWLEDGMENT.

In closing this report we desire to place on record our sincere appreciation of the many courtesies extended to us by the Mayor and members of the City Council, and of the faithful and loyal co-operation of the various assistants who have been engaged in the work. Particular mention should be made of the careful work done by Mr. Hommon, who has had immediate charge of the experiments and whose previous experience at similar experiment stations at Columbus, Ohio, and Waterbury, Conn., has proven of much value.

Respectfully submitted,

HARRISON P. EDDY,
Consulting Engineer.

MORRELL VROOMAN,
City Engineer.



Appendix A.

Maximum and Minimum Daily Temperature

of Air at Gloversville, N. Y.

for the Months of

December, January, February and March,

from 1898 to 1908 inclusive.

In considering these temperatures, the fact must be borne in mind that the thermometer was entirely exposed to the weather to correspond with the conditions that would actually obtain in the sewage purification plant when completed, and for this reason the temperatures during warm days when the thermometer was exposed to the direct rays of the sun would be higher than on warm days when the direct rays of the sun did not shine upon the thermometer, and on cold, windy days the effect of the cold wind would be to lower the temperature registered.

Day.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1898	Max	33	38	40	35	35	32	30	20	24	25	24	24	0	20	24	29	34	34	30	34	30	29	18	18	19	30	35	4	27	43	28
	Min	27	27	19	18	30	25	22	17	6	19	23	20	-2	-10	9	14	10	20	18	10	18	15	4	0	3	12	10	0	13	20	19
1899	Max	48	45	43	30	25	25	25	35	21	28	44	50	40	28	25	28	32	41	44	35	40	40	39	30	25	19	22	25	25	4	12
	Min	34	37	33	24	19	14	5	14	5	2	28	42	30	25	20	9	7	20	30	28	24	19	24	30	10	2	3	7	1	-3	-3
1900	Max	36	39	44	36	32	35	35	30	31	14	25	19	37	10	10	14	10	20	37	30	29	32	36	40	39	20	27	32	29	30	35
	Min	25	30	24	30	28	22	25	21	6	-5	5	7	12	-4	-8	-2	-8	-6	10	29	20	12	15	29	27	14	14	17	17	10	27
1901	Max	37	47	33	20	18	17	23	30	39	45	38	32	41	60	60	18	15	19	17	20	18	21	28	36	28	35	37	26	38	36	31
	Min	11	22	18	8	1	-11	-9	15	24	32	30	27	26	38	13	4	3	4	4	4	-4	-4	16	25	18	15	25	7	26	25	25
1902	Max	35	45	46	46	29	18	27	27	-3	30	34	16	13	13	16	40	40	34	40	34	34	40	34	17	26	20	22	24	26	34	27
	Min	25	25	32	28	7	5	1	-3	-20	-12	14	4	3	-1	-10	16	25	26	23	17	14	35	10	-1	16	10	15	10	7	17	13
1903	Max	29	32	34	30	30	31	34	34	27	32	28	[illegible]	42	20	15	21	18	17	13	40	41	35	35	40	38	25	8	5	11	21	22
	Min	1	10	23	10	15	22	27	26	21	18	15	18	19	7	7	14	0	-2	-15	5	27	14	12	28	24	-4	-12	1	-12	1	3
1904	Max	31	26	19	23	26	26	33	27	23	10	12	25	21	13	10	23	15	24	24	28	24	31	43	44	10	20	33	39	22	27	41
	Min	23	16	12	-1	14	15	12	11	6	-6	-8	3	11	-12	-9	-2	2	14	1	21	9	5	26	8	-6	10	19	20	15	19	20
1905	Max	24	33	38	36	26	30	38	39	39	32	22	35	38	34	18	23	28	35	37	39	36	40	36	34	28	37	42	42	48	41	33
	Min	4	13	33	19	8	22	29	26	25	12	9	22	22	12	0	0	4	6	31	32	31	34	31	19	17	23	17	17	31	28	27
1906	Max	40	30	34	20	27	37	36	5	17	28	32	12	26	26	40	39	33	30	18	30	36	34	25	9	12	29	32	33	38	36	36
	Min	30	4	13	-7	6	20	-2	-14	0	10	10	-8	5	18	18	28	25	9	-9	-2	18	25	5	-2	0	12	14	28	31	32	32
1907	Max	28	29	28	23	27	32	36	39	41	43	40	24	30	24	31	32	39	30	28	27	35	32	39	41	32	35	40	45	37	38	28
	Min	20	19	14	7	-2	12	18	20	24	36	23	17	13	19	20	25	20	21	20	14	23	19	10	31	24	24	14	34	23	24	21
1908	Max	56	37	22	25	26	16	37	33	25	20	25	27	25	35	42	38	29	26	25	27	33	28	19	21	33	32	33	29	26	38	38
	Min	37	17	13	8	19	-6	13	22	20	-7	-1	22	15	18	25	29	10	14	10	20	20	7	-2	-1	27	29	18	23	11	22	24

Day.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1898	Max	25	14	20	11	35	34	30	40	[illegible]	40	30	35	49	30	[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24	20	30	[illegible]	17	18	[illegible]	23
	Min	0	-7	-3	-13	11	10	22	20	15	5	11	10	28	25	27	15	7	-2	[illegible]	11	31	30	29	20	12	10	10	-5	-4	-22	-16
1899	Max	2	3	20	37	40	20	30	30	32	0	8	23	32	24	35	38	30	22	28	32	37	38	40	30	18	34	30	22	12	14	20
	Min	-6	-19	2	21	25	24	13	7	4	-12	-20	-14	10	30	28	19	30	0	[illegible]	-4	10	28	27	20	15	8	-1	-12	-2	-9	-1
1900	Max	15	22	14	25	35	35	30	30	19	37	18	32	25	28	32	40	25	32	44	45	38	42	42	19	30	12	19	34	17	17	20
	Min	4	5	2	6	10	23	13	8	0	10	5	10	4	18	15	27	10	9	32	24	13	13	25	0	10	2	1	7	9	2	0
1901	Max	24	20	6	24	24	23	34	29	38	20	31	32	24	23	33	37	32	21	2	10	40	35	25	34	37	25	24	22	20	21	25
	Min	13	10	-6	-4	3	9	15	7	26	17	24	25	14	0	20	30	21	-1	-12	-17	7	5	-5	12	21	12	-1	9	8	12	14
1902	Max	20	20	34	8	23	32	32	28	28	32	28	23	15	24	24	31	22	25	34	22	28	42	30	21	28	32	38	10	12	18	18
	Min	-7	-1	4	-3	4	18	14	19	22	24	22	10	8	2	11	22	-3	-3	12	-10	1	28	25	20	5	0	10	0	1	9	-1
1903	Max	38	30	35	38	34	30	23	28	14	18	18	28	14	18	28	33	39	33	5	20	40	32	30	10	27	27	30	40	38	37	25
	Min	20	17	31	30	25	10	7	10	1	-2	5	9	9	10	15	28	25	0	-10	-10	20	24	4	-8	7	17	14	27	34	18	17
1904	Max	26	10	0	-7	-4	10	21	25	32	20	23	27	32	31	22	19	19	[illegible]	-4	13	23	34	40	32	14	14	18	12	18	23	24
	Min	12	-7	-9	-19	-31	-22	10	5	20	20	15	-5	25	24	12	4	4	-13	-32	-5	13	20	33	14	-1	-7	7	-14	5	2	7
1905	Max	42	30	35	13	8	19	44	28	22	17	20	37	37	10	14	23	20	28	39	25	25	27	18	12	18	10	21	10	13	20	15
	Min	33	33	13	-1	-5	-2	19	15	11	15	11	14	9	3	-8	10	10	23	19	22	12	17	-4	[illegible]	10	-11	-4	12	2	-8	-11
1906	Max	31	27	22	41	39	32	37	24	14	15	28	38	34	33	33	40	38	40	30	33	50	49	49	47	29	32	41	40	35	45	36
	Min	25	10	9	20	29	25	15	8	-1	-6	1	23	19	20	28	30	20	24	18	14	33	30	41	20	10	11	15	20	7	13	28
1907	Max	36	35	32	41	42	37	40	38	36	26	34	30	33	32	31	15	0	21	33	42	30	18	13	-2	7	17	10	19	22	23	16
	Min	33	31	24	31	26	21	33	29	15	0	24	18	20	19	15	3	-9	3	21	28	8	8	-11	-24	-5	5	-19	-5	5	13	-15
1908	Max	34	31	28	26	34	25	32	34	28	17	20	35	30	28	19	23	25	29	28	27	43	42	30	23	24	32	25	22	20	8	10
	Min	28	22	19	10	3	-5	0	30	13	8	2	22	25	12	0	13	8	18	0	-1	20	29	15	14	-3	12	14	4	8	-17	-16
1909	Max	24	27	32	37	39	40	20	12	28	33	30	28	11	27	35	22	23	21	9	32	34	45	44	37	30	33	32	20	20	28	23
	Min	12	0	9	30	34	20	2	-4	8	26	28	12	-7	7	22	-4	3	-5	-18	9	13	20	27	33	31	23	15	12	4	18	0

Day.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1898	Max	25	6	11	23	27	33	35	43	44	47	43	45	13	35	29	28	18	28	35	33	34	35	39	38	35	33	35	34	..
	Min	0	−12	−11	−6	−4	6	−3	10	27	32	31	34	22	15	15	5	−6	10	28	29	27	30	27	24	23	19	19	15	..
1899	Max	14	23	25	27	26	26	25	27	5	3	4	5	12	16	30	40	44	45	37	43	45	50	35	25	32	39	35	42	..
	Min	−3	0	11	12	4	12	10	5	−7	−8	−18	−10	−2	5	−8	6	22	20	26	22	28	30	25	9	2	10	28	19	..
1900	Max	9	12	19	36	25	32	30	36	42	28	37	34	55	34	29	20	25	24	19	27	36	38	34	39	32	5	8	18	..
	Min	0	−10	−3	17	15	10	4	28	20	18	13	24	34	19	19	8	7	8	5	12	12	30	28	26	4	−6	−12	−4	..
1901	Max	20	22	23	24	16	10	14	14	12	15	27	26	4	9	21	28	28	31	30	23	16	22	16	19	32	32	19	19	..
	Min	−5	1	−5	16	9	−1	−3	0	3	4	3	10	−1	−1	7	21	20	16	19	15	8	−2	−1	−5	7	15	5	−1	..
1902	Max	26	35	30	14	14	15	21	20	26	23	19	23	22	24	28	26	27	27	20	28	28	38	33	40	40	48	45	44	..
	Min	14	26	12	3	3	−11	−5	9	14	10	2	−1	7	6	8	−5	14	11	8	8	2	16	1	12	27	34	25	34	..
1903	Max	32	40	41	36	34	33	29	25	28	39	36	40	41	32	25	25	15	7	9	29	15	27	40	40	31	39	45	56	..
	Min	17	29	32	30	15	15	16	9	14	24	19	33	30	12	11	15	1	−5	−7	−1	−7	17	2	22	19	18	21	33	..
1904	Max	23	9	16	10	14	31	48	47	5	10	12	12	20	23	23	9	4	11	23	22	33	41	34	32	16	16	26	33	33
	Min	8	−8	5	3	3	8	30	0	−12	−13	−9	−16	−5	−2	8	−9	−8	−12	5	1	−7	25	16	16	0	−4	−5	9	23
1905	Max	19	15	8	9	11	24	25	14	29	28	20	20	36	9	18	12	25	25	18	34	40	29	32	34	32	34	24	33	..
	Min	−9	5	−5	−16	−19	11	7	−11	11	21	8	−7	6	−4	−2	−7	2	6	−10	−2	31	13	11	4	−1	9	8	12	..
1906	Max	36	31	13	32	29	3	13	21	28	27	18	30	38	33	21	26	29	29	36	44	39	44	41	48	40	36	25	20	..
	Min	26	−2	−10	10	3	−25	−11	−13	10	15	−14	−9	9	17	5	−9	−7	−1	21	22	33	31	14	19	31	20	9	0	..
1907	Max	32	36	33	18	13	14	20	24	20	28	32	5	16	37	39	35	33	20	26	34	30	12	8	13	28	13	24	16	..
	Min	12	28	9	0	5	−5	−16	8	−5	14	3	−12	−3	5	14	15	14	0	5	16	10	−11	−13	−16	−4	−5	4	−10	..
1908	Max	27	25	18	13	1	28	24	9	6	21	36	28	33	42	44	39	32	17	19	23	28	27	14	23	27	34	37	27	17
	Min	3	5	4	−15	−28	−7	9	−8	−11	−15	2	1	25	31	35	20	14	0	8	13	9	14	−5	−10	−9	22	17	7	4
1909	Max	7	26	21	22	38	44	33	32	24	36	28	34	38	30	30	30	27	26	36	40	32	38	35	37	36	25	34	29	..
	Min	−13	2	−7	1	9	28	16	12	3	13	17	16	26	18	18	22	15	17	17	31	17	15	19	31	11	5	20	18	..

Day.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1898	Max	35	35	40	38	37	40	46	51	51	50	55	45	47	40	41	40	50	51	55	55	40	39	50	45	48	55	52	49	44	50	47
	Min	5	10	25	10	24	16	15	24	22	24	32	39	38	30	19	28	35	28	38	35	30	29	29	24	26	28	39	40	35	28	28
1899	Max	33	30	42	39	43	42	32	29	32	41	44	46	35	40	31	35	28	32	37	26	34	32	35	32	40	40	40	35	32	32	43
	Min	20	16	27	29	32	24	19	10	9	15	26	27	20	19	17	14	−3	8	24	15	2	18	26	20	20	20	4	20	22	20	23
1900	Max	36	22	25	35	19	32	26	32	39	39	17	19	30	28	19	21	14	17	46	35	25	39	40	26	33	33	39	40	40	43	40
	Min	17	16	10	13	10	7	18	5	3	15	2	−6	−4	10	9	12	−4	−12	10	21	19	20	27	14	12	10	29	20	25	21	27
1901	Max	35	38	39	41	35	8	8	25	38	39	32	36	30	30	35	39	37	32	46	35	38	41	37	45	39	44	40	37	29	30	36
	Min	−1	21	3	29	10	1	0	−9	16	30	18	28	24	20	27	31	16	11	25	19	19	30	23	16	29	35	35	29	20	18	19
1902	Max	52	42	40	31	28	29	44	40	38	45	44	54	54	46	50	50	51	34	27	41	55	53	56	49	53	54	51	54	57	56	52
	Min	38	35	28	22	18	17	14	28	31	31	20	35	36	25	22	33	31	20	16	20	34	30	29	26	27	25	25	35	44	40	33
1903	Max	42	33	39	40	35	40	39	45	46	46	44	48	50	59	50	42	48	56	67	73	65	49	45	57	41	47	52	42	41	40	52
	Min	18	15	21	30	30	20	18	36	39	41	36	33	33	26	34	29	35	40	36	35	50	34	35	36	30	28	30	32	22	23	33
1904	Max	32	42	40	21	21	31	39	39	35	22	29	22	28	28	34	30	32	31	40	40	41	40	40	46	42	48	33	31	36	46	36
	Min	20	15	20	1	−10	12	29	34	15	6	15	10	12	10	23	19	16	22	32	27	14	29	34	29	32	31	24	16	9	16	30
1905	Max	24	24	28	30	22	30	25	37	38	39	28	27	27	27	31	33	38	49	45	36	32	42	40	38	52	50	46	55	68	57	53
	Min	−1	−2	11	13	−3	9	−4	25	22	24	10	10	2	0	−1	6	10	25	32	22	27	25	25	27	34	24	36	32	36	38	33
1906	Max	23	24	31	37	36	35	31	38	42	40	33	32	24	27	18	29	27	29	23	24	29	28	18	24	38	34	44	43	42	37	40
	Min	2	7	24	31	27	9	17	27	31	28	20	19	10	13	10	7	13	5	6	17	17	15	14	−7	−6	7	36	31	25	31	32
1907	Max	26	36	31	24	31	29	26	30	31	26	38	33	38	40	38	38	45	38	32	39	44	50	58	45	43	48	59	58	65	61	45
	Min	1	23	22	14	13	17	−1	14	18	10	5	13	28	28	23	20	25	23	21	27	19	31	39	31	13	25	37	45	38	40	31
1908	Max	21	33	28	27	28	27	37	38	34	25	45	48	48	42	42	42	22	31	34	28	34	45	46	45	36	58	48	50	45	41	39
	Min	−5	17	25	16	3	11	26	29	18	3	13	25	24	30	33	22	8	20	27	11	3	17	28	35	15	26	41	38	32	27	26
1909	Max	28	38	36	33	20	31	32	31	28	46	36	31	33	35	30	31	30	28	32	32	29	33	35	40	37	35	39	44	36	36	39
	Min	1	23	20	20	12	15	11	14	8	28	19	22	20	20	20	17	14	15	11	27	13	11	18	19	32	26	16	24	27	26	31

Appendix B.

Quantities of Crude Sewage Delivered

by Intercepting Sewer,

Temperature of Air and Condition of Weather

from February 1908 to June 1908.

Date 1908.	24 hrs. Gals. per	Temp. Deg. Fahr. at			Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		8 a. m.	12 m.	5 p. m.	Max.	Min.		
Feb. 1.....	....	17	20	25	26	0	21	Snowing.
" 2.....	....	14	16	12	28	0	14	Snowing.
" 3.....	....	8	20	14	29	-20	14	Clear.
" 4.....	....	-15	-7	-13	-2	-15	-12	Clear.
" 5.....	....	-30	3	0	22	-31	-9	Snowing 5 p. m.
" 6.....	....	22	34	25	39	9	27	Snowing 8 a. m.
" 7.....	....	12	12	6	13	-10	10	Clear.
" 8.....	....	-7	1	3	10	-15	-1	Clear.
" 9.....	....	-10	22	22	18	-17	11	Clear.
" 10.....	....	-12	20	18	38	-9	11	Clear.
" 11.....	....	5	35	24	38	1	21	Clear.
" 12.....	....	3	37	29	40	5	23	Clear.
" 13.....	....	30	36	33	37	29	33	Rain 8 a. m.-12 m.
" 14.....	....	35	45	39	49	34	40	Clear.
" 15.....	5,170,000	40	45	41	30	-8	42	Rain.
" 16.....	2,716,000	30	42	38	18	-3	37	Clear.
" 17.....	3,976,000	20	24	18	23	15	21	Clear.
" 18.....	2,135,000	-1	11	18	23	-1	9	Clear.
" 19.....	2,103,000	15	18	18	29	8	17	Snowing.
" 20.....	2,018,000	18	22	12	24	-10	17	Clear.
" 21.....	2.040,000	10	28	29	24	-17	22	Clear.
" 22.....	2.169,000	19	26	17	33	-10	21	Clear.
" 23.....	2.169,000	-4	19	36	37	-1	15	Clear.
" 24.....	2.369,000	-1	33	28	35	13	17	Clear.
" 25.....	2.403,000	28	35	33	40	6	20	Clear.
" 26.....	2.472,000	19	39	29	35	-13	32	Snowing.
" 27.....	....	8	17	24	40	2	29	Clear.
" 28.....	....	7	16	20	25	0	16	Clear.
" 29.....	2,336,000	5	11	22	20	-8	13	Clear.
Average..	2,629,000	...	..	...	..	...	...	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at			Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		8 a. m.	12 m.	5 p. m.	Max.	Min.		
March 1...	2,040,000	10	18	22	32	20	17	Clear.
" 2...	2,541,000	30	33	34	34	23	32	Rain 8 a. m. and 12 m.
" 3...	2,472,000	25	28	24	31	13	26	Snow 12 m.-5 p. m.
" 4...	2,437,000	19	27	23	29	−1	23	Clear.
" 5...	2,201,000	7	29	26	43	5	21	Clear.
" 6...	2,201,000	20	28	26	35	20	25	Snowing at 12 m.
" 7...	2,268,000	35	33	30	49	29	33	Rain at 5 p. m.
" 8...	....	30	28	25	40	28	28	Clear.
" 9...	....	32	30	28	39	4	30	Clear.
" 10...	....	11	22	21	25	7	18	Snowing at 5 p. m.
" 11...	....	23	49	47	46	21	40	Clear.
" 12...	....	32	46	47	55	21	42	Clear.
" 13...	....	33	50	41	50	29	45	Clear.
" 14...	....	33	37	41	52	28	37	Clear.
" 15...	....	32	32	23	48	20	29	Clear.
" 16...	....	18	21	22	36	6	29	Clear.
" 17...	3,002,000	28	36	30	28	18	20	Snow 8 a.m. and 12 m.
" 18...	3,044,000	30	32	28	38	32	31	Snow 12 m.-5 p. m.
" 19...	3,411,000	37	34	27	36	7	33	Rain at 8 a. m.
" 20...	3,411,000	18	27	23	30	−1	23	Clear.
" 21...	3,156,000	14	29	49	50	13	31	Clear.
" 22...	4,813,000	33	44	40	44	28	39	Clear.
" 23...	5,488,000	33	46	40	52	23	40	Rain at 5 p. m.
" 24...	....	40	43	37	53	20	40	Clear.
" 25...	....	15	23	54	55	15	31	Clear.
" 26...	6,610,000	33	56	57	61	33	49	Clear.
" 27...	7,543,000	44	50	40	58	33	45	Clear.
" 28...	5,215,000	42	60	66	69	24	56	Clear.
" 29...	4,671,000	40	42	38	60	22	40	Clear.
" 30...	6,085,000	30	41	40	45	23	37	Clear.
" 31...	4,306,000	35	38	38	44	29	37	Clear.
Average..	3,845,000	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at 8 a. m.	12 m.	5 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
April 1...	3,856,000	31	40	64	69	29	45	Clear.
" 2...	4,058,000	34	30	28	35	18	31	Snow 12 m.-5 p. m.
" 3....	3,764,000	21	21	26	28	10	23	Clear.
" 4....	3,618,000	14	20	44	49	31	26	Clear.
" 5....	3,528,000	28	30	32	56	29	30	Clear.
" 6...	5,271,000	36	46	68	74	30	50	Clear.
" 7....	4,017,000	42	50	63	67	30	52	Clear.
" 8...	5,708,000	31	32	38	40	23	34	Rain.
" 9...	5,439,000	25	36	56	57	21	39	Clear.
" 10...	4,182,000	34	48	51	57	35	44	Clear.
" 12...	4,140,000	46	30	40	49	25	39	Rain at 8 a. m.
" 11...	3,599,000	42	48	50	39	27	47	Clear.
" 13...	3,478,000	33	43	52	53	18	43	Rain at 8 a. m.
" 14...	3,499,000	31	49	51	84	30	44	Clear.
" 15...	3,107,000	41	41	44	44	18	42	Rain 12 m.-5 p. m.
" 16...	3,498,000	22	36	39	67	17	32	Clear.
" 17...	2,933,000	28	40	50	71	24	39	Clear.
" 18...	3,044,000	36	52	46	57	21	45	Clear.
" 19...	3,044,000	30	40	42	48	23	37	Clear.
" 20...	2,812,000	28	39	33	45	13	33	Clear.
" 21...	2,616,000	26	34	40	54	25	33	Clear.
" 22...	2,860,000	38	50	62	75	40	50	Clear.
" 23...	2,752,000	55	69	69	82	34	64	Clear.
" 24...	2,787,000	49	71	68	95	45	63	Clear.
" 25...	2,752,000	48	52	54	76	41	51	Rain at 12 m.
" 26...	2,612,000	50	56	58	74	40	55	Clear.
" 27...	2,860,000	61	72	69	78	47	67	Clear.
" 28...	2,933,000	52	62	56	66	31	57	Clear.
" 29...	2,612,000	41	48	49	68	36	46	Rain at 8 a. m.
" 30...	3,365,000	37	32	51	58	31	40	Rain at 8 a. m.
Average..	3,491,000	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at 8 a. m.	12 m.	5 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
May 1....	4,476,000	33	36	38	48	28	36	Clear.
" 2....	3,335,000	37	48	48	55	28	44	Rain
" 3....	3,020,000	39	42	46	60	26	42	Clear.
" 4....	....	42	52	52	69	24	49	Clear.
" 5....	2,612,000	40	56	61	80	37	52	Clear.
" 7....	2,576,000	51	59	49	61	37	53	Clear.
" 8....	3,860,000	39	39	40	43	38	39	Rain.
" 9....	4,140,000	43	55	50	57	42	49	Rain at 5 p. m.
" 10....	3,383,000	42	45	43	57	34	43	Clear.
" 11....	2,612,000	53	64	70	57	34	62	Clear.
" 12....	2,998,000	53	64	70	80	52	62	Clear.
" 13....	2,823,000	58	76	72	85	49	69	Clear.
" 14....	2,716,000	53	59	60	69	44	57	Clear.
" 15....	3,258,000	44	50	56	72	37	50	Rain at 8 a. m.
" 16....	2,860,000	50	59	54	60	39	54	Rain at 5 p. m.
" 17....	....	55	67	65	95	39	62	Clear.
" 18....	....	50	64	70	98	40	61	Clear.
" 19....	....	56	70	73	110	46	66	Clear.
" 20....	....	52	68	68	80	42	63	Clear.
" 21....	....	55	67	64	67	53	62	Rain at 8 a. m.-5 p. m.
" 21....	....	61	69	65	71	60	65	Rain at 5 p. m.
" 22....	....	66	69	66	72	58	67	Rain.
" 23....	....	65	79	77	95	44	74	Clear.
" 24....	....	62	68	66	93	44	65	Clear.
" 25....	....	60	79	78	111	53	72	Clear.
" 26....	....	75	80	78	91	57	78	Clear.
" 27....	....	67	77	73	91	50	72	Clear.
" 28....	....	64	81	81	118	56	75	Clear.
" 29....	....	60	78	63	92	58	67	Rain at 5 p. m.
" 30....	2,576,000	64	73	68	58	73	68	Rain at 12 m.-5 p. m.
" 31....	2,686,000	64	72	66	52	75	67	Rain at 5 p. m.
Average..	3,121,000	..	..	..	...	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
June 1....	2,506,000	40	56	52	68	67	43	56	Rain at 12 m.-5 p. m.
" 2....	2,136,000	37	57	60	64	66	34	55	Clear.
" 3....	2,040,000	57	40	64	65	68	52	57	Clear.
" 4....	2,201,000	46	56	72	70	74	44	61	Clear.
" 5....	2,235,000	48	45	71	72	81	47	59	Clear.
" 6....	2,300,000	50	50	70	73	83	48	61	Clear.
" 7....	2,437,000	52	50	76	78	91	53	64	Clear.
" 8....	2,576,000	58	56	80	82	85	58	69	Clear.
" 9....	2,541,000	58	62	84	72	88	45	69	Rain at 6 p. m.-12 mid
" 10....	2,437,000	47	60	70	64	88	45	60	Clear.
" 11....	....	48	56	69	66	90	44	58	Clear.
" 12....	....	48	47	72	72	74	47	60	Clear.
" 13....	....	46	49	75	76	75	56	62	Clear.
" 14....	2,632,000	48	50	70	62	84	56	58	Clear.
" 15....	2,646,000	50	62	63	53	72	60	57	Rain at 6 a. m.
" 16....	....	44	52	60	60	67	12	54	Clear.
" 17....	....	46	69	64	45	68	20	56	Clear.
" 18...	....	52	46	71	76	86	40	61	Clear.
" 19....	2,612,000	68	54	80	82	86	66	71	Clear.
" 20....	2,576,000	64	58	82	78	71	56	71	Clear.
" 21....	....	50	66	78	80	78	63	69	Clear.
" 22....	....	56	63	73	76	80	58	67	Clear.
" 23....	....	68	58	80	76	82	60	71	Clear.
" 24....	....	60	66	85	70	88	50	70	Rain at 12 mid.
" 25....	....	48	58	70	72	98	45	62	Clear.
" 26....	....	50	50	71	74	99	49	62	Clear.
" 27...	2,136,000	52	52	76	78	80	50	60	Clear.
" 28...	1,849,000	56	54	72	80	80	50	66	Clear.
" 29....	2,169,000	60	56	70	76	79	60	66	Clear.
" 30....	2,103,000	50	64	73	68	72	48	64	Clear.
Average.	2,341,000	..	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
July 1.....	2,040,000	60	52	72	76	85	60	65	Clear.
" 2.....	2,403,000	60	60	78	74	82	58	68	Clear.
" 3.....	2,201,000	61	60	72	70	78	65	66	Clear.
" 4.....	1,912,000	58	..	78	68	82	66	68	Rain 6 p. m.-12 mid.
" 5.....	1,607,000	59	66	82	78	83	57	71	Clear.
" 6.....	2,235,000	63	58	80	84	85	62	71	Clear.
" 7.....	2,302,000	67	65	86	72	84	52	73	Rain 6 p. m.-mid. Clear.
" 8.....	2,335,000	46	56	62	62	87	43	57	Clear.
" 9....	2,369,000	49	48	70	71	74	50	60	Clear.
" 10.....	2,285,000	56	50	75	76	80	54	64	Clear.
" 11.....	2,136,000	57	55	77	77	83	65	67	Clear.
" 12.....	1,758,000	58	57	77	78	80	64	68	Rain at 12 m. Clear.
" 13.....	2,175,000	60	60	76	78	79	64	69	Clear.
" 14.....	2,268,000	54	66	72	70	75	52	66	Clear.
" 15.....	2,040,000	50	56	67	62	67	50	59	Rain at 6 p. m. Clear.
" 16.....	1,704,000	52	47	50	70	71	50	55	Clear.
" 17.....	....	58	50	65	72	74	60	61	Clear.
" 18.....	....	63	63	68	75	75	58	67	Rain.
" 19.....	1,849,000	58	70	71	68	76	56	67	Clear.
" 20.....	2,235,000	60	57	66	76	78	62	65	Clear.
" 21.....	2,136,000	66	61	78	72	78	63	69	Rain at 6 p. m. Clear.
" 22.....	2,110,000	63	66	72	80	79	59	70	Clear.
" 23.....	1,975,000	72	62	78	80	81	64	73	Rain at 12 mid. Clear
" 24.....	1,912,000	68	69	75	80	79	62	73	Rain 6 a.m.-12 m. Clear.
" 25.....	2,051,000	64	64	67	80	66	52	69	Clear.
" 26.....	1,667,000	60	62	72	79	76	54	68	Clear.
" 27.....	2,136,000	62	60	77	82	81	57	70	Clear.
" 28.....	2,110,000	73	60	81	79	83	65	73	Clear.
" 29.....	2,072,000	64	68	80	86	84	61	75	Clear.
" 30.....	2,040,000	64	64	82	88	86	63	75	Clear.
" 31.....	2,102,000	67	66	83	86	85	61	76	Clear.
Average..	2 075 000	..	..	..		..	..	.	

Date 1908.	Gals. per 24 hrs.	Fahr. at Temp. Deg. 12 mid.	6 a. m.	12 m.	6 p. m.	Deg. F. Temp. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
Aug. 1....	1,912,000	58	61	70	79	77	52	67	Clear.
" 2.....	1,567,000	60	60	72	75	76	47	67	Clear.
" 3.....	1,912,000	64	64	72	76	76	60	69	Clear.
" 4....	2,008,000	70	66	77	84	84	65	72	Clear.
" 5.....	2,169,000	69	68	75	78	76	62	72	Rain.
" 6....	2,136,000	76	68	77	79	79	62	75	Rain 12 mid.
" 7....	2,268,000	60	64	66	72	73	55	65	Rain.
" 8.....	1,847,000	58	60	73	75	77	52	66	Clear.
" 9.....	1,607,000	62	56	71	73	73	52	65	Clear.
" 10....	2,136,000	60	58	72	72	75	54	67	Rain 12 mid.
" 11....	....	59	59	75	73	78	57	66	Clear.
" 12.....	....	70	60	77	79	79	62	71	Clear.
" 13....	....	70	70	82	78	83	66	75	Clear.
" 14....	....	64	68	86	80	78	62	72	Clear.
" 15.....	....	58	64	72	66	75	49	62	Clear.
" 16....	....	68	52	72	76	74	62	67	Rain 12 mid.
" 17....	....	69	62	71	69	75	58	68	Rain.
" 18....	....	62	62	67	60	68	47	63	Clear.
" 19....	....	54	54	68	62	67	45	59	Rain 6 p. m.
" 20....	....	56	46	63	64	65	42	57	Clear.
" 21....	....	56	46	67	67	72	54	59	Clear.
" 22....	....	66	58	66	72	74	53	65	Rain 6 a. m.-12 noon.
" 23....	....	48	56	66	62	67	43	58	Clear.
" 24....	....	48	46	64	66	67	42	56	Clear.
" 25....	....	58	56	65	66	69	43	61	Clear.
" 26....	....	50	57	63	63	65	42	58	Clear.
" 27....	....	51	50	63	66	68	43	57	Clear.
" 28....	....	52	44	62	68	68	45	56	Clear.
" 29....	....	54	48	62	71	71	43	59	Clear.
" 30....	....	58	57	73	72	77	42	65	Clear.
" 31....	....	58	53	74	74	80	43	65	Clear.
Average..	1 956 000	..	..	.	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at 12 mid.	6 a. m.	12 m.	6 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
Sept. 1.....	....	60	58	75	76	81	46	67	Clear.
" 2.....	....	56	62	69	77	71	41	66	Rain 6 a. m.-12 Mid.
" 3.....	....	43	54	62	69	70	41	57	Clear.
" 4.....	....	52	41	60	68	79	46	55	Clear.
" 5.....	....	59	47	69	68	73	41	61	Clear.
" 6.....	....	58	60	68	64	74	50	63	Rain 6 p. m.
" 7.....	....	46	50	65	60	70	43	55	Clear.
" 8.....	....	56	46	63	65	66	45	57	Clear.
" 9.....	....	56	50	66	65	77	41	59	Clear.
" 10.....	....	56	51	68	64	79	40	59	Clear.
" 11.....	....	62	53	70	76	76	45	65	Rain.
" 12.....	....	58	58	70	69	74	41	64	Clear.
" 13.....	....	59	54	62	72	75	44	62	Clear.
" 14.....	....	49	49	63	62	75	49	56	Clear.
" 15.....	....	40	38	61	58	68	33	49	Clear.
" 16.....	....	50	36	60	62	77	43	52	Clear.
" 17.....	....	53	46	67	65	75	49	57	Clear.
" 18.....	....	50	43	67	60	73	43	55	Clear.
" 19.....	....	40	40	65	55	76	33	50	Clear.
" 20.....	....	46	37	67	58	73	31	52	Clear.
" 21.....	....	59	42	67	63	71	36	57	Clear.
" 22.....	....	58	54	70	64	74	31	61	Clear.
" 23.....	....	58	51	68	64	73	43	60	Clear.
" 24.....	1,944,000	58	56	73	76	80	54	68	Clear.
" 25.....	1,912,000	60	53	73	67	81	56	63	Clear.
" 26.....	1,788,000	63	54	70	64	75	57	62	Clear.
" 27.....	1,435,000	53	60	71	70	73	55	63	Clear.
" 28.....	2,185,000	49	59	70	66	73	47	61	Clear.
" 29.....	2,072,000	32	46	54	47	55	35	45	Clear.
" 30.....	1,784,000	39	31	54	53	58	44	44	Clear.
Average..	1,874,000	..	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
Oct. 1.....	2,206,000	44	40	62	52	65	48	50	Rain 6 p. m.-12 m.
" 2.....	2,090,000	34	42	47	39	65	31	41	Clear.
" 3.....	1,872,000	36	34	51	45	56	36	42	Clear.
" 4.....	1,519,000	39	34	58	56	60	34	47	Clear.
" 5.....	1,940,000	40	34	52	48	54	38	44	Clear.
" 6.....	1,876,000	40	34	56	50	62	35	45	Clear.
" 7.....	1,865,000	44	34	55	56	62	41	47	Clear.
" 8.....	1,917,000	54	42	60	62	62	42	54	Clear.
" 9.....	1,950,000	47	52	58	51	62	45	52	Clear.
" 10.....	1,840,000	54	32	50	56	58	32	48	Rain 12 mid.
" 11.....	1,770,000	42	54	60	54	56	36	53	Clear.
" 12.....	1,922,000	31	38	48	38	58	36	59	Clear.
" 13.....	1,940,000	30	24	49	42	50	24	36	Clear.
" 14.....	2,017,000	45	30	54	53	56	30	46	Clear.
" 15.....	2,071,000	47	42	62	56	62	34	52	Clear.
" 16.....	2,071,000	48	40	68	66	66	42	56	Clear.
" 17.....	1,980,000	49	45	64	58	71	45	54	Clear.
" 18.....	1,716,000	48	44	66	57	70	44	54	Clear.
" 19.....	2,111,000	42	57	60	45	71	50	51	Clear.
" 20.....	1,974,000	28	36	50	37	69	31	38	Clear.
" 21.....	1,926,000	32	25	48	41	50	24	37	Clear.
" 22.....	1,966,000	37	27	50	44	53	28	37	Clear.
" 23.....	2,146,000	56	32	62	52	56	30	51	Clear.
" 24.....	2,240,000	64	58	64	64	64	38	63	Clear.
" 25.....	1,800,000	62	62	64	65	66	60	63	Clear.
" 26.....	2,434,000	58	60	56	58	56	57	58	Rain 12 m.-6 p. m.
" 27.....	1,926,000	56	56	61	56	54	58	57	Clear.
" 28.....	2,419,000	51	56	52	52	61	44	53	Rain.
" 29.....	2,069,000	52	51	54	54	55	46	53	Clear.
" 30.....	1,988,000	32	46	45	36	55	45	40	Clear.
" 31.....	1,830,000	36	29	34	35	52	24	34	Clear.
Average..	1,977,000	..	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid	6 a. m.	12 m.	6 p. m.	Max.	Min.		
Nov. 1.....	1,410,000	32	28	32	29	36	22	30	Clear.
" 2.....	1,871,000	28	22	40	39	34	18	32	Clear.
" 3.....	1,800,000	40	41	45	40	40	23	41	Clear.
" 4.....	1,994,000	46	52	33	25	52	34	39	Clear.
" 5.....	1,916,000	24	23	32	28	35	15	27	Clear.
" 6.....	1,897,000	29	30	30	34	30	21	31	Rain 6 a. m.-12 m.
" 7.....	1,860,000	36	36	32	40	33	28	36	Rain 6 a. m.- 12 m.
" 8.....	1,594,000	34	36	36	42	38	30	37	Clear.
" 9.....	1,923,000	36	32	50	48	43	26	41	Clear.
" 10.....	1,883,000	32	30	42	48	56	24	38	Rain 6 p. m.
" 11.....	2,016,000	43	44	42	45	47	39	43	Rain.
" 12.....	1,824,000	36	34	28	30	43	25	32	Clear.
" 13.....	1,824,000	32	32	32	34	32	25	32	Clear.
" 14.....	1,811,000	38	34	38	44	33	28	38	Clear.
" 15.....	1,583,000	42	36	32	32	38	24	35	Clear.
" 16.....	1,925,000	30	40	38	36	32	20	36	Clear.
" 17.....	1,886,000	32	32	31	32	42	22	32	Clear.
" 18.....	2,053,000	28	36	30	46	33	17	35	Clear.
" 19.....	1,846,000	38	39	36	45	32	26	39	Clear.
" 20....	1,861,000	40	39	36	42	34	29	39	Clear.
" 21.....	1,855,000	32	32	42	34	36	15	35	Clear.
" 22.....	1,520,000	30	30	42	39	53	17	35	Clear.
" 23.....	1,890,000	35	32	44	44	56	20	39	Clear.
" 24.....	1,870,000	36	38	54	48	54	28	44	Clear.
" 25.....	1,766,000	48	50	53	57	68	32	52	Clear.
" 26.....	1,549,000	52	50	57	56	54	46	54	Clear.
" 27.....	1,900,000	52	44	43	39	56	38	44	Clear.
" 28.....	1,827,000	36	38	34	39	58	31	39	Clear.
" 29.....	1,529,000	38	38	38	37	40	30	38	Clear.
" 30.....	1,882,000	35	38	38	46	44	24	39	Clear.
Average..	1,812,000	..	..	..	..	..	..	..	

Date 1908.	Gals. per 24 hrs.	Temp. Deg. Fahr. at 12 mid.	6 a. m.	12 m.	6 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
Dec. 1.....	1,853,000	42	50	50	48	54	35	48	Slight rain 12 m.
" 2.....	1,862,000	28	22	18	22	50	15	23	Snow 6 a. m.-12 m.
" 3.....	1,925,000	18	18	18	24	20	9	20	Snow 6 p. m.-12 mid.
" 4.....	2,016,000	19	20	26	38	28	4	26	Snow 6 p. m.-12 mid.
" 5.....	2,025,000	34	34	20	18	29	16	27	Clear.
" 6.....	1,699,000	8	−9	20	12	24	−10	7.7	Clear.
" 7.....	2,536,000	18	26	34	28	31	−6	27	S. 12 mid., R. 6 p. m.-
" 8.....	2,083,000	24	20	24	30	34	20	25	Clear. [Noon.
" 9.....	2,004,000	28	30	22	12	28	20	23	Clear.
" 10.....	2,065,000	−2	−10	12	6	24	−12	1.5	Clear.
" 11.....	2,108,000	0	6	18	18	17	−2	11	Snow 12 mid.-6 a. m.
" 12.....	2,059,000	26	28	30	22	30	18	27	Snow 12 noon-6 p. m.
" 13.....	1,704,000	20	12	28	20	30	10	20	Snow 12 mid.
" 14.....	2,023,000	20	16	33	25	34	16	24	Snow 12 mid.
" 15.....	2,134,000	28	30	38	32	46	25	32	Rain 6 a. m.
" 16.....	1,971,000	27	26	34	26	40	26	28	Clear.
" 17.....	1,931,000	24	12	24	15	34	14	19	Clear.
" 18.....	2,027,000	12	12	20	15	26	12	15	S'w 6 p. m., 12-6 a. m.
" 19.....	1,987,000	12	14	22	22	28	6	18	Snow 12 noon-6 p. m.
" 20.....	1,684,000	21	21	26	20	32	20	22	Snow 6 a. m.-12 noon.
" 21.....	2,004,000	18	20	30	24	31	20	23	Snow 6 a. m.-12 noon.
" 22.....	1,893,000	22	6	20	8	32	2	14	Clear.
" 23.....	2,025,000	2	−2	14	4	26	−6	4.5	Clear.
" 24.....	2,040,000	0	0	20	18	26	0	9.5	Snow 12 mid.-6 a. m.
" 25.....	1,675,000	26	26	36	30	37	17	30	Snow 6 a. m.
" 26.....	1,931,000	30	26	28	24	36	27	27	Snow 12 mid.-12 noon.
" 27.....	1,594,000	22	22	36	28	36	16	27	Clear.
" 28....	1,986,000	26	22	24	20	44	20	23	Clear.
" 29.....	1,976,000	14	15	34	16	34	15	20	Clear.
" 30.....	1,916,000	6	14	22	30	38	6	18	Snow 12 noon.
" 31.....	1,990,000	36	30	26	20	36	22	28	Rain 6 p. m.
Average..	1,959,000	..	...	..	..	..	...	....	

Date 1909.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
Jan. 1.....	1,674,000	18	12	22	...	22	8	17	Clear.
" 2.....	1,820,000	...	...	20	8	22	-6	14	Clear.
" 3.....	1,602,000	10	15	35	30	34	7	23	Clear.
" 4.....	1,904,000	30	31	38	35	38	30	34	Clear.
" 5.....	2,638,000	34	34	38	36	40	34	36	Rain.
" 6.....	2,749,000	36	36	30	14	40	30	29	Clear.
" 7.....	2,380,000	4	-2	4	2	30	-2	2	Clear.
" 8.....	2,773,000	0	-6	12	10	10	-6	4	Clear.
" 9.....	2,168,000	8	10	30	26	31	6	19	Clear.
" 10.....	1,780,000	26	27	36	31	36	26	30	Snow 12 mid. Clear.
" 11.....	2,139,000	30	32	32	22	36	30	29	Snow melting. Clear.
" 12.....	2,022,000	20	16	14	8	32	12	15	Rain.
" 13.....	2,106,000	-10	-2	10	6	16	-12	1	Clear.
" 14.....	2,184,000	6	10	20	26	20	6	16	Rain and snow.
" 15.....	2,049,000	28	30	33	15	33	20	27	Clear.
" 16.....	2,055,000	-6	-8	2	0	37	-8	-3	Clear.
" 17.....	1,802,000	2	12	18	19	18	0	13	Snow.
" 18.....	2,144,000	20	12	10	-12	27	-12	8	Clear.
" 19.....	2,268,000	-26	-20	6	8	6	-26	-8	Clear.
" 20.....	2,234,000	10	24	30	22	30	4	22	Clear.
" 21.....	2,133,000	8	14	34	32	35	10	22	Clear.
" 22.....	2,212,000	28	26	38	33	40	24	31	Snow melting.
" 23.....	2,319,000	32	28	46	35	54	28	35	Snow melting.
" 24.....	2,681,000	34	34	38	30	48	33	34	Rain.
" 25.....	3,049,000	30	30	33	30	38	30	31	Rain 12 mid. Clear.
" 26.....	2,652,000	30	22	27	22	33	22	25	Snow melting. Clear.
" 27.....	2,476,000	10	14	34	28	34	9	22	Snow 6 p. m. Clear.
" 28.....	2,323,000	24	14	14	6	36	6	15	Clear.
" 29.....	2,740,000	0	0	24	16	24	-2	10	Clear.
" 30.....	2,213,000	18	18	36	16	36	16	22	Snow 6 p. m.-12 mid.
" 31.....	1,841,000	13	12	4	-6	36	-6	6	Clear. [Clear.
Average..	2.230.000	...	...	..	...	..	...	..	

Date 1909.	Gals. per 24 hrs.	Temp. Deg. Fahr. at 12 mid.	6 a. m.	12 m.	6 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
Feb. 1.....	2,275,809	-14	-20	-7	-4	10	-20	-11	Clear.
" 2.....	2,195,027	0	4	20	16	18	-9	10	Snow 6 a. m.-12 noon.
" 3.....	2,126,093	0	-18	12	10	30	-18	1	Clear.
" 4.....	2,102,396	5	15	32	16	32	-18	17	Clear.
" 5.....	2,294,120	10	22	42	35	42	10	27	Rain 6 p. m.
" 6.....	2,361,977	36	35	44	26	44	36	35	Rain 12 m.
" 7.....	2,114,244	20	14	34	26	46	12	23	Clear.
" 8.....	2,492,307	18	8	30	18	30	8	18	Clear.
" 9.....	2,369,517	9	3	14	10	30	2	9	Rain 6 p. m.
" 10.....	2,537,545	8	20	34	22	34	10	21	Snow 12 p. m.-12 m.
" 11.....	2,398,599	18	15	20	16	36	14	17	Clear.
" 12.....	2,331,819	8	16	30	27	30	13	20	Clear.
" 13.....	2,262,884	24	26	38	28	43	25	29	Clear.
" 14.....	1,976,376	20	16	20	16	38	16	18	Clear.
" 15.....	2,869,292	24	26	26	27	30	16	26	Rain.
" 16.....	3,007,160	20	22	25	24	28	22	23	Rain.
" 17.....	....	20	12	21	15	28	12	17	Clear.
" 18.....	....	19	14	22	19	24	14	18	Clear.
" 19.....	2,736,808	16	18	36	34	38	15	26	Rain 6 p. m.
" 20.....	6,040,376	37	35	32	28	40	32	33	Rain 6 a. m.-12 m.
" 21.....	3,746,051	24	22	26	24	33	21	24	Clear.
" 22.....	3,194,576	22	14	34	31	34	13	25	Clear.
" 23.....	....	23	16	36	30	38	16	26	Rain 6 p. m.-12 p. m.
" 24.....	5,269,070	22	15	34	33	44	28	26	Rain 6 a. m.-12 m.
" 25.....	5,175,363	29	14	12	8	36	8	16	Clear.
" 26.....	3,781,595	5	0	10	20	28	0	9	Clear.
" 27.....	3,113,793	19	19	36	28	36	18	25	Clear.
" 28.....	2,564,472	24	16	30	14	40	18	21	Clear.
Average..	2,933,490	...	...	..	..	..	...	...	

Date 1909.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
Mch. 1.....	2,715,266	0	-3	20	23	30	-2	10	Snow midnight.
" 2.....	2,792,817	22	26	36	27	41	20	28	Clear.
" 3.....	2,732,500	18	17	36	31	37	16	25	Clear.
" 4.....	2,686,185	27	28	33	17	50	26	26	Snow 12 noon.
" 5.....	2,516,003	16	8	16	12	36	9	13	Snow.
" 6.....	2,459,994	14	11	24	28	24	11	19	Clear.
" 7.....	2,101,319	13	13	32	29	46	10	22	Snow 12 noon.
" 8.....	2,331,819	26	10	24	20	34	9	20	Clear.
" 9.....	2,330,742	8	7	26	26	34	6	17	S'w 12 M., r'n 12 mid.
" 10.....	2,726,037	28	30	46	33	46	24	34	Rain 6 a. m.
" 11.....	2,666,797	28	16	22	18	48	16	21	Clear.
" 12.....	2,531,082	20	20	28	25	30	20	23	Clear.
" 13.....	2,546,162	21	20	33	29	34	18	26	Clear.
" 14.....	2,300,583	17	20	30	26	38	16	23	Clear.
" 15.....	2,723,883	24	14	26	20	36	14	21	Clear.
" 16.....	2,664,643	16	15	38	27	38	12	24	Snow.
" 17.....	2,586,014	24	10	22	17	44	8	18	Snow 6 p. m.
" 18.....	2,401,830	14	10	24	26	26	12	18	Clear.
" 19.....	2,405,061	11	6	33	26	34	6	19	Snow 6 p. m.
" 20.....	2,344,744	26	27	32	30	41	26	29	Clear.
" 21.....	2,141,172	18	4	24	22	38	4	17	Clear.
" 22.....	2,604,325	10	6	28	26	37	6	17	Clear.
" 23.....	2,928,532	18	16	33	34	40	12	25	Clear.
" 24.....	3,376,606	17	16	34	34	46	14	25	Snow 12 mid.
" 25.....	4,237,309	29	31	32	34	50	30	31	Rain.
" 26.....	4,180,122	28	24	26	26	34	24	26	Snow.
" 27.....	3,905,462	25	14	38	35	40	14	28	Clear.
" 28.....	4,280,293	22	24	32	35	41	20	28	Clear.
" 29.....	4,817,765	26	24	32	32	42	22	28	Clear.
" 30.....	4,787,607	20	24	32	30	44	22	26	Clear.
" 31.....	5,376,780	28	28	36	38	42	28	32	Clear.
Average..	3,006,000	..	..	..	..	..	..	..	

Date 1909.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
April 1.....	5,620,000	26	23	36	37	48	22		Clear.
" 2.....	5,543,000	20	18	44	40	52	20		Clear.
" 3.....	6,194,000	34	34	46	46	52	34		Rain 12 mid.
" 4.....	6,103,000	33	31	37	36	50	24		Clear.
" 5.....	6,472,000	27	24	50	55	60	24		Clear.
" 6.....	6,582,000	40	37	62	56	70	40		Clear.
" 7.....	....	50	46	53	44	68	40		Clear.
" 8.....	....	37	30	43	44	70	30		Clear.
" 9.....	4,516,000	24	29	22	29	53	24		Clear.
" 10.....	4,253,000	23	18	22	23	52	18		Clear.
" 11.....	3,657,000	13	15	30	44	34	13		Clear.
" 12.....	4,044,000	23	23	24	59	32	22		Clear.
" 13.....	3,953,000	38	44	75	58	68	38		Clear.
" 15.....	5,523,000	54	37	40	38	72	40		Clear.
" 14.....	4,745,000	30	30	41	38	42	31		Clear.
" 16.....	2,730,000	25	23	50	52	50	22		Clear.
" 17.....	2,531,000	38	38	54	54	62	38		Clear.
" 18.....	2,131,000	32	28	52	54	70	32		Clear.
" 19.....	2,599,000	40	38	73	52	84	30		Rain 12 mid.
" 20.....	2,555,000	36	34	38	42	52	34		Clear.
" 21.....	2,652,000	36	36	40	39	54	34		Clear.
" 22.....	2,748,000	38	38	52	58	54	38		Rain 12 mid.-6 a. m.
" 23.....	2,627,000	36	34	42	40	74	32		Clear.
" 24.....	2,451,000	27	25	42	46	62	24		Clear.
" 25.....	2,130,000	18	19	56	16	52	18		Snow 6 a. m.
" 26.....	2,500,000	36	20	56	44	66	20		Clear.
" 27.....	2,602,000	24	25	67	43	67	24		Clear.
" 28.....	2,696,000	37	29	44	36	65	29		Rain 12 mid.-6 a. m.
" 29.....	2,591,000	22	22	42	30	49	22		Snow 6 p. m.
" 30.....	3,756,000	28	28	39	34	43	27		
Average..	3,803,000	..	..	..	..	..	..		

Date 1909.	Gals. per 24 hrs.	Fahr. at Temp. Deg. 12 mid.	6 a. m.	12 m.	6 p. m.	Temp. Deg. F. Max.	Min.	Temp. Ave. for 24 hrs.	Weather.
May 1.....	3,462,000	33	34	42	32	44	33	36	Rain.
" 2.....	2,854,000	34	35	37	40	40	32	36	Snow 6 p. m. Clear.
" 3.....	3,132,000	28	30	44	39	44	28	35	Rain 6 p. m. Clear.
" 4.....	3,123,000	37	30	52	48	52	30	41	Rain 12 mid. Clear.
" 5.....	2,920,000	37	36	62	61	62	37	49	Rain 12 mid. Clear.
" 6.....	2,829,000	46	48	70	68	70	46	58	Clear.
" 7.....	2,905,000	44	42	72	52	76	42	55	Rain 6 p. m. Clear.
" 8.....	2,614,000	44	40	70	74	75	40	57	Clear.
" 9.....	2,259,000	48	46	74	68	84	46	61	Rain 6 p. m. Clear.
" 10.....	3,294,000	55	53	70	59	80	53	62	Rain 6 a. m. Clear.
" 11.....	3,280,000	52	40	46	48	60	41	48	R'n 12 p.m.-6 a.m. Cl'r.
" 12.....	2,890,000	38	36	58	58	62	34	48	Clear.
" 13.....	2,670,000	42	39	66	65	66	39	53	Clear.
" 14.....	2,629,000	56	59	64	65	70	55	61	R'n 12 p.m.-6 a.m. Cl'r.
" 15.....	2,490,000	56	54	68	67	80	52	62	Rain 12 p. m. Clear,
" 16.....	2,885,000	53	50	58	59	70	48	56	Rain.
" 17.....	2,919,000	50	48	49	47	62	48	51	Rain.
" 18.....	2,864,000	46	45	54	52	54	46	49	Rain 12 p. m. Clear.
" 19.....	2,645,000	48	46	60	61	82	46	57	Clear.
" 20.....	2,686,000	50	45	56	58	64	45	53	R'n 12 p.m.-6 a.m. Cl'r.
" 21.....	2,546,000	46	43	52	52	60	42	49	Rain 6 p. m. Clear.
" 22.....	2,429,000	43	41	48	48	54	41	46	Rain.
" 23.....	2,083,000	40	42	53	54	53	40	47	Clear.
" 24.....	2,392,000	45	45	64	61	84	44	57	Clear.
" 25.....	2,323,000	45	45	60	57	76	40	54	Clear.
" 26.....	2,210,000	38	37	66	66	83	38	55	Clear.
" 27.....	2,492,000	46	48	62	56	69	44	54	Rain 12 m. Clear.
" 28.....	2,450,000	55	55	64	58	64	55	58	R'n 12 p.m.-6 a.m. Cl'r.
" 29.....	2,263,000	51	52	63	60	66	52	57	Rain 12 p. m.-6 a. m.
" 30.....	1,913,000	..	..	..	..	70	42	56	Clear.
" 31.....	1,883,000	..	..	..	..	71	41	56	Clear.
Average..	2,656,000	..	..	..	..	..	..	..	

Date 1909.	Gals. per 24 hrs.	Temp. Deg. Fahr. at				Temp. Deg. F.		Temp. Ave. for 24 hrs.	Weather.
		12 mid.	6 a. m.	12 m.	6 p. m.	Max.	Min.		
June 1....	2,131,478	48	48	66	66	70	42	58	Clear.
" 2....	2,044,233	50	47	66	68	70	44	57	Clear.
" 3....	2,001,149	52	52	72	72	70	53	62	Clear.
" 4....	2,125,015	56	54	72	58	88	52	60	Rain 6 p. m.
" 5....	2,792,588	56	55	60	56	68	65	57	Rain.
" 6....	2,037,770	52	53	64	62	70	69	58	Rain 12 mid.
" 7....	2,266,116	54	52	64	58	72	52	57	Clear.
" 8....	2,090,095	50	48	70	62	84	46	58	Clear.
" 9....	2,189,641	44	48	62	53	80	44	52	Rain 6 p. m.
" 10....	2,559,087	49	50	65	54	62	50	55	Rain.
" 11....	2,568,781	52	54	64	63	64	43	58	Rain 12 mid.
" 12....	2,209,029	49	52	68	68	80	48	59	Clear.
" 13....	2,643,101	59	50	64	60	64	50	56	Rain.
" 14....	2,979,156	58	59	72	68	78	56	64	Rain 12 mid.
" 15....	2,534,313	56	53	62	58	82	60	57	Clear.
" 16....	2,455,685	44	46	64	68	80	42	56	Clear.
" 17....	2,483,690	50	52	70	60	72	48	58	Rain 6 p. m.
" 18....	2,499,846	56	56	50	44	78	48	52	Rain.
" 19....	2,221,954	42	48	60	64	80	38	54	Rain 12 mid.
" 20....	1,891,285	52	53	70	71	86	50	62	Clear.
" 21....	2,357,669	60	60	75	70	74	56	66	Clear.
" 22....	2,309,200	60	80	74	74	96	56	72	Clear.
" 23....	2,273,655	66	64	76	77	84	63	71	Rain.
" 24....	2,166,704	66	68	82	78	86	66	74	Rain 6 a. m.
" 25....	2,109,936	66	66	80	78	85	62	73	Clear.
" 26....	1,994,686	65	68	82	75	100	61	73	Clear.
" 27....	1,994,686	56	60	76	76	98	55	67	Clear.
" 28....	2,170,254	65	60	74	77	78	60	69	Rain 6 a. m.
" 29....	2,084,086	66	66	74	69	103	60	69	Clear.
" 30....	1,975,299	56	57	72	75	94	50	65	Clear.
Average..	2,272,000	..	..	..	..	...	..	..	

Appendix C.

Temperatures of Air in Filter House.

Date 1908.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.
Nov. 21..	40	38	56	44
" 22..	40	38	..	46
" 23..	44	42	48	47
" 24..	44	42	52	50
" 25..	48	48	..	52
" 26..	50	50	56	53
" 27..	50	47	..	45
" 28..	44	44	45	44
" 29.	43	42	47	44
" 30..	42	42	44	46
Dec. 1..	46	48	50	46
" 2..	41	38	40	38
" 3..	38	37	40	38
" 4..	36	34	36	38
" 5..	38	38	40	40
" 6..	38	36	38	38
" 7..	40	38	40	40
" 8..	39	38	40	40
" 9..	40	39	40	39
" 10..	36	36	36	36
" 11..	34	34	36	38
" 12..	38	38	40	40
" 13..	38	38	40	40
" 14..	38	40	41	42
" 15..	42	42	42	42

Date 1908.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.
Dec. 16..	41	40	42	40
" 17..	40	39	40	38
" 18..	38	38	38	38
" 19..	38	37	38	30
" 20..	39	39	39	40
" 21..	38	38	39	40
" 22..	39	38	38	38
" 23..	38	36	38	38
" 24..	36	35	39	36
" 25..	37	37	39	39
" 26..	39	38	39	38
" 27..	39	39	40	40
" 28..	38	38	40	40
" 29..	39	38	40	40
" 30..	38	38	38	38
" 31..	40	39	39	39
1909.				
Jan. 1..	38	38	..	..
" 2..	..	..	36	36
" 3..	36	36	38	38
" 4..	38	38	40	40
" 5..	40	40	41	42
" 6..	42	42	41	38
" 7..	36	36	34	34
" 8..	34	30	34	34

Date 1909.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.
Jan. 9..	34	32	32	36
" 10..	36	36	37	38
" 11..	38	38	39	38
" 12..	37	36	36	36
" 13..	36	36	36	36
" 14.	36	36	36	36
" 15..	37	38	40	40
" 16..	38	36	36	36
" 17..	34	35	36	37
" 18..	37	36	34	36
" 19..	37	34	38	38
" 20..	38	38	38	38
" 21..	38	37	38	40
" 22..	40	39	40	42
" 23..	42	40	44	44
" 24..	43	42	42	42
" 25..	40	40	42	41
" 26..	40	39	40	40
" 27..	38	36	38	40
" 28..	39	38	40	38
" 29..	36	34	38	38
" 30..	38	37	38	38
" 31..	38	37	37	35

Date 1909.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.	Date 1909.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.	Date 1909.	Hour. 12 mid.	6 a. m.	12 noon.	6 p. m.
Feb. 1..	33	34	37	37	**Feb.** 21..	38	36	40	40	Mar. 13..	39	38	38	40
" 2..	38	36	38	38	" 22..	38	36	40	42	" 14..	38	38	41	42
" 3..	36	33	36	38	" 23..	38	36	38	..	" 15..	38	37	40	39
" 4..	35	33	34	36	" 24..	..	..	38	39	" 16..	37	36	38	40
" 5..	36	36	37	38	" 25..	38	34	34	34	" 17..	39	38	38	38
" 6..	38	40	40	38	" 26..	34	34	36	37	" 18..	36	35	38	40
" 7..	38	36	39	40	" 27..	36	36	36	38	" 19..	37	34	37	39
" 8..	38	36	39	38	" 28..	38	37	38	38	" 20..	38	38	40	40
" 9..	37	36	36	37	Mar. 1..	36	33	36	39	" 21..	37	36	38	39
" 10..	36	36	40	38	" 2..	38	37	38	40	" 22..	37	36	38	40
" 11..	36	38	38	36	" 3..	38	37	38	42	" 23..	37	36	38	40
" 12..	35	35	38	39	" 4..	40	39	38	38	" 24..	44	38	36	42
" 13..	38	38	40	40	" 5..	37	36	37	36	" 25..	40	40	40	40
" 14..	39	38	38	36	" 6..	36	36	38	40	" 26..	40	39	38	..
" 15..	37	37	38	38	" 7..	38	36	37	37	" 27..	42	38	37	42
" 16..	38	38	38	38	" 8..	37	36	38	39	" 28..	43	38	38	..
" 17..	38	36	38	38	" 9..	37	35	36	37	" 29..	40	38	37	42
" 18..	37	37	38	39	" 10..	38	38	40	41	" 30..	42	38	38	41
" 19..	38	39	37	40	" 11..	40	36	39	39	" 31..	42	39	39	42
" 20..	40	40	40	38	" 12..	37	36	40	40					

Appendix D.

Results of Chemical Analyses of Station Sewage.

1908 Date	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Fats
		Parts per Million														
May 26.....	53	15.0	7.0	8.0	10.0	0.05	0.82	64	31	33	98	60	28	32	204	..
" 27.....	54	16.0	11.0	5.0	8.0	0.35	0.68	66	36	30	114	152	64	88	180	23
28.....	55	19.0	11.0	8.0	9.0	1.20	0.00	62	32	30	94	152	108	44	188	28
' 29.....	55	14.0	7.2	6.8	9.0	1.10	0.84	69	33	36	91	...	...	..	178	38
" 30.....	55	7.2	3.1	4.1	9.0	0.08	0.18	32	15	17	41	155	95	60	158	24
" 31.....	52	6.8	3.6	3.2	11.0	0.04	0.78	27	16	11	42	86	60	26	162	15
Average..	54	13.0	7.1	5.9	9.3	0.47	0.55	53	27	26	80	121	71	50	179	26

1908 Date	Temp. Deg. F.	Parts per Million: Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Carbonic Acid.	Fats
June 1.....	54	13.0	7.8	5.2	8.4	0.27	1.88	54	28	26	80	220	148	78	184	-9.0	35
" 2.....	53	18.0	12.0	6.0	8.4	0.26	1.89	49	29	20	85	162	110	52	196	-8.0	52
3.....	52	18.0	10.0	8.0	9.0	0.30	0.93	52	28	24	132	158	104	54	204	-5.0	30
" 4.....	52	20.0	12.0	8.0	9.4	0.25	1.49	61	30	31	118	290	180	110	224	-14.0	47
5.....	52	15.0	9.2	5.8	11.0	0.45	1.09	68	27	41	116	312	244	68	228	.....	60
" 6.....	52	15.0	8.9	6.1	9.7	0.80	0.84	68	29	39	80	224	164	60	218	-9.0	37
" 7.....	51	8.1	3.3	4.8	14.0	0.08	0.54	30	16	14	51	123	97	26	160	23.0	..
8.....	53	19.0	9.4	9.6	14.0	0.06	0.41	74	39	35	146	356	248	108	252	-11.0	..
9.....	53	15.0	8.2	6.8	12.0	0.16	0.42	55	26	29	114	158	116	42	204	-1.0	36
" 10.....	53	15.0	9.0	6.0	12.0	0.55	0.84	68	38	30	118	178	122	56	212	-18.0	..
" 11.....	52	20.0	9.2	11.0	11.0	0.35	1.29	73	40	33	142	202	129	73	208	-7.0	63
" 12.....	54	21.0	11.0	10.0	11.0	0.30	1.44	82	46	36	142	278	194	84	208	-14.0	43
14.....	54	9.7	3.7	6.0	14.0	0.10	0.32	41	18	23	51	187	140	47	158	.....	31
15.....	55	22.0	5.6	16.0	13.0	0.45	0.68	96	42	54	128	686	308	378	200	-4.0	59
16.....	53	21.0	11.0	10.0	11.0	0.35	0.83	93	40	53	128	390	240	150	196	-6.0	63
17.....	52	28.0	12.0	16.0	11.0	0.40	0.63	102	42	60	134	564	322	242	208	-5.0	60
18.....	55	25.0	13.0	12.0	11.0	0.50	0.94	92	38	54	98	452	246	206	228	-18.0	61
19.....	53	28.0	11.0	17.0	11.0	0.80	0.00	114	42	72	110	688	354	334	196	-7.0	57
21.....	54	15.0	2.9	12.0	14.0	0.06	0.28	43	16	27	53	484	378	106	166	18.0	45
22.....	52	31.0	10.0	21.0	15.0	0.50	0.37	120	43	77	136	690	408	282	252	-5.0	76
" 23.....	55	30.0	14.0	16.0	13.0	0.45	0.37	121	40	81	122	742	374	368	180	-10.0	59
24.....	53	29.0	8.8	20.0	13.0	0.08	0.39	108	32	76	136	652	346	306	208	7.0	52
" 25.....	53	22.0	7.4	15.0	15.0	0.40	0.42	108	43	65	156	532	310	222	244	-4.0	59
" 26.....	55	31.0	11.0	20.0	12.0	0.24	0.38	118	39	79	140	580	344	236	224	-6.0	68
" 28.....	55	15.0	7.3	7.7	12.0	0.03	0.49	50	24	26	50	270	204	66	168	19.0	..
" 29.....	55	32.0	9.2	23.0	15.0	....	....	133	46	87	126	706	382	324	244	7.0	..
" 30.....	57	30.0	9.4	21.0	14.0	0.61	....	117	40	77	132	620	330	290	244	-9.0	..
Average..	53	21.0	9.1	11.9	12.0	0.34	0.77	81	34	47	112	404	242	162	208	-3.8	52

1908 Date	Temp. Deg. F.	Parts per Million: Nitrogen, Organic, Total.	Nitrogen, Organic, Dissolved.	Nitrogen, Organic, Suspended.	Nitrogen, Free Ammonia.	Nitrogen, Nitrites.	Nitrogen, Nitrates.	Oxygen Consumed, Total.	Oxygen Consumed, Dissolved.	Oxygen Consumed, Suspended.	Chlorine.	Suspended Matter, Total.	Suspended Matter, Volatile.	Suspended Matter, Fixed.	Alkalinity in Terms of Ca Co 3	Carbonic Acid.	Fats
July 1.....	57	31.0	9.4	22.0	15.0	0.06	0.07	129	38	91	154	756	378	378	216	8.0	42
" 2.....	57	30.0	13.0	17.0	12.0	0.06	0.06	118	44	74	154	598	354	244	232	-5.0	41
" 4.....	57	30.0	3.3	27.0	12.0	0.08	0.00	112	18	94	79	854	598	256	202	36.0	26
5.....	56	12.0	2.7	9.3	15.0	0.04	0.07	40	16	24	61	168	132	36	164	22.0	30
6.....	58	27.0	9.4	18.0	14.0	0.08	0.06	121	43	78	142	682	394	288	220	-3.0	79
7.....	58	22.0	8.4	14.0	12.0	0.11	0.11	101	43	58	164	356	194	162	216	-3.0	50
8.....	55	28.0	8.6	19.0	14.0	0.25	0.42	116	46	70	182	526	288	238	240	-9.0	71
9.....	57	24.0	8.8	15.0	13.0	0.09	0.43	98	44	54	164	458	282	176	224	-3.0	60
10.....	57	27.0	10.0	17.0	14.0	0.28	0.31	113	47	66	164	454	246	208	244	-11.0	46
12.....	56	14.0	3.9	10.0	13.0	0.03	0.00	63	15	48	58	356	260	96	180	22.0	39
13.....	58	25.0	10.0	15.0	14.0	0.05	0.21	112	45	67	134	464	286	178	252	-4.0	78
14.....	59	30.0	6.0	24.0	15.0	0.07	0.22	134	47	87	168	698	358	340	232	-11.0	70
15.....	58	29.0	7.8	21.0	14.0	0.07	0.55	172	43	129	130	708	432	276	220	.....	85
16.....	57	23.0	7.8	15.0	14.0	0.40	0.53	116	40	76	130	450	284	166	228	-12.0	69
18.....	57	29.0	8.4	21.0	12.0	0.06	0.41	117	34	83	102	898	406	492	216	11.0	79
19.....	56	8.8	3.5	5.3	13.0	0.07	0.25	49	19	30	55	182	139	43	156	24.0	30
20.....	57	26.0	8.0	18.0	13.0	0.08	0.74	112	41	71	144	542	322	220	224	8.0	75
21.....	61	34.0	7.4	27.0	13.0	0.22	0.29	135	42	93	164	624	368	256	244	21.0	78
22.....	63	23.0	9.0	14.0	12.0	0.06	0.46	98	38	60	158	450	266	184	212	-4.0	59
23.....	64	17.0	5.0	12.0	12.0	0.09	0.53	89	42	47	138	374	224	150	204	14.0	56
24.....	63	22.0	9.0	13.0	12.0	0.07	0.40	99	39	60	150	460	258	202	208	-9.0	62
26.....	61	18.0	4.8	13.0	13.0	0.07	0.25	51	16	35	59	296	224	72	166	28.0	50
27.....	63	21.0	8.8	12.0	13.0	0.30	0.23	90	33	57	160	446	244	202	232	-4.0	53
28....	64	....	....	....	12.0	0.22	0.30	...	..	..	214	564	204	360	216	.....	63
29.....	64	25.0	10.0	15.0	11.0	0.06	0.56	119	37	82	150	672	152	520	224	-2.0	..
" 30.....	65	23.0	8.5	14.0	13.0	0.09	0.43	118	42	76	160	670	362	308	212	8.0	..
31.....	64	32.0	7.5	24.0	14.0	0.08	0.19	106	39	67	152	640	410	230	212	6.0	..
Average.	59	24.3	7.7	16.6	13.0	0.12	0.30	105	37	68	137	531	299	232	215	5.1	58

Parts per Million

Date 1908	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Carbonic Acid.	Fats
Aug. 1.....	64	26.0	6.2	20.0	10.0	0.45	0.32	118	35	83	112	658	418	240	180	9	74
" 3.....	65	27.0	12.0	15.0	11.0	0.26	0.61	111	38	73	132	612	366	246	208	–5	81
" 4.....	64	24.0	9.0	15.0	12.0	0.35	0.63	124	52	72	128	600	336	264	204	–8	72
" 5.....	64	37.0	10.0	27.0	13.0	0.30	0.42	135	46	89	174	832	424	408	208	–6	75
" 8.....	65	22.0	5.3	17.0	12.0	0.11	0.41	80	35	45	118	506	280	226	178	10	34
9.....	62	9.6	3.5	6.1	13.0	0.07	0.45	41	15	26	57	162	123	39	148	19	27
11.....	64	27.0	9.4	8.0	10.0	0.22	0.88	117	40	77	112	632	362	270	204	–10	54
12.....	64	23.0	7.2	16.0	9.0	0.24	0.43	86	31	55	138	458	310	148	184	19	72
13.....	65	26.0	8.4	18.0	11.0	0.25	0.57	110	39	71	130	518	296	222	196	–8	59
14.....	65	20.0	4.8	15.0	13.0	0.26	0.41	106	38	68	154	508	282	226	196	–6	57
15.....	64	24.0	7.8	16.0	14.0	0.04	0.43	110	35	75	98	548	350	198	180	4	72
16.....	62	12.0	2.8	9.2	15.0	0.10	0.27	56	18	38	59	210	160	50	162	15	32
17.....	66	29.0	7.8	21.0	10.0	0.40	0.63	122	36	86	120	1424	1036	388	184	–6	71
19.....	63	23.0	10.0	13.0	9.4	0.20	0.90	100	40	60	140	412	192	220	192	–10	48
20.....	63	27.0	11.0	16.0	10.0	....	....	103	45	58	124	540	306	234	196	–17	71
21.....	63	20.0	8.4	12.0	9.4	0.35	0.85	89	53	36	132	368	224	144	204	–16	42
" 22.....	62	12.0	4.7	7.3	11.0	0.35	0.37	55	25	30	82	194	148	46	164	9	27
" 23.....	61	13.0	3.9	9.1	11.0	0.10	0.17	52	19	33	49	289	218	71	164	14	38
24.....	62	11.0	5.2	5.8	19.0	0.22	0.71	79	45	34	132	256	160	96	224	–26	44
25.....	63	15.0	6.8	8.2	11.0	0.20	0.52	75	36	39	118	234	168	66	232	–3	39
26.....	63	18.0	3.3	15.0	14.0	0.25	0.47	102	36	66	120	358	220	138	232	–11	53
" 27.....	62	19.0	9.0	10.0	11.0	0.14	0.68	95	41	54	144	270	170	100	204	–8	39
" 28.....	62	15.0	7.0	8.0	10.0	0.40	0.68	68	32	36	97	192	126	66	196	–7	32
29.....	62	22.0	5.1	17.0	11.0	0.24	0.43	83	28	55	90	264	200	64	212	8	42
30.....	60	8.6	3.3	5.3	14.0	0.06	0.26	42	24	18	46	128	118	10	176	20	26
31.....	62	21.0	11.0	10.0	11.0	0.30	0.60	97	39	58	110	450	284	166	220	–9	53
Average.	63	20.4	7.0	13.4	11.7	0.23	0.52	90	35	55	112	447	280	167	196	–1.1	51

11

Date 1908	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid.	Fats
Sept. 1.....	62	27	10.	17.	13	0.25	0.62	109	52	57	110	640	328	318	240	....	-18	50
" 2.....	63	29	9.	20.	11	0.34	0.64	126	58	68	148	492	322	170	250	....	-18	39
" 3....	62	17	7.4	9.6	11	0.40	0.78	84	44	40	134	284	180	104	236	....	-15	41
" 4.....	62	18	7.8	10.0	13	0.12	0.20	92	39	53	158	476	192	284	240	....	-2	44
" 5.....	61	13	4.0	9.0	12	0.04	0.43	78	33	45	112	242	182	60	216	....	9	35
6.....	62	11	....	....	14	0.10	0.22	49	24	25	42	204	154	50	158	....	33	34
7.....	61	12	2.8	9.2	14	0.02	0.15	53	29	24	49	58	27	31	180	....	35	38
" 8.....	62	26	13.0	13.0	12	0.30	0.57	130	64	66	150	386	194	192	272	....	-15	50
' 9.....	62	18	7.0	11.0	13	0.20	0.47	76	53	23	134	174	124	50	228	....	2	30
" 10.....	62	18	8.0	10.0	12	0.24	0.33	86	52	34	136	248	172	76	248	....	-8	34
" 11.....	62	18	10.0	8.0	14	0.16	0.66	110	61	49	170	256	186	70	208	....	-5	34
" 12.....	62	25	13.0	12.0	12	0.20	0.47	135	92	43	150	404	254	150	208	....	-15	39
13.....	60	13	....	....	16	0.06	0.21	72	29	43	57	164	130	34	142	....	45	24
14.....	62	29	14.0	15.0	13	0.24	0.58	133	64	69	162	454	254	200	224	....	-23	56
15.....	61	22	16.0	6.0	14	0.24	0.53	124	62	62	174	472	268	204	216	....	-27	42
' 16.....	61	22	12.0	10.0	12	0.28	0.72	119	76	43	188	350	206	144	208	....	-22	38
" 17.....	62	19	14.0	5.0	13	0.22	0.71	108	58	50	158	300	178	122	252	....	-13	28
" 18.....	62	18	9.6	8.4	12	0.08	0.59	125	61	64	136	252	170	82	232	....	16	39
' 19.....	61	21	9.6	11.0	12	0.22	0.88	128	64	64	140	348	210	138	204	....	-13	36
" 21.....	62	30	22.0	8.0	12	0.18	0.82	121	65	56	142	292	178	114	224	1.20	-19	32
" 22.....	61	24	12.0	12.0	11	0.22	0.78	115	79	36	148	272	154	118	232	0.80	-24	30
" 23.....	61	21	7.6	13.0	10	0.24	0.96	110	60	50	164	262	154	108	216	1.70	-24	44
" 24.....	62	21	14.0	7.0	11	0.40	0.70	122	68	54	164	308	182	126	232	0.14	-15	46
" 25.....	62	25	11.0	14.0	12	0.32	0.71	137	66	71	138	500	304	196	244	2.10	-15	68
" 26.....	62	19	10.0	9.0	11	0.22	0.71	118	73	45	134	312	206	106	224	0.00	-18	32
" 27.....	61	17	3.5	13.0	15	0.04	0.33	77	25	52	52	286	236	50	186	0.00	25	40
" 28.....	62	25	9.6	15.0	13	0.34	0.00	112	46	66	140	514	284	230	204	1.10	-6	51
" 29.....	60	27	15.0	12.0	11	0.40	0.70	136	60	76	138	364	312	252	196	0.69	-17	69
" 30.....	60	28	12.0	16.0	11	0.28	0.72	138	59	79	138	700	514	186	224	1.10	-6	71
Average..	62	21	11.0	11.0	12	0.22	0.56	108	56	52	134	352	216	136	219	0.88	-6	42

Parts per Million

Date 1908	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Oct. 1.....	59	24.0	13.0	11.0	11	0.35	0.00	144	69	75	138	514	322	192	200	1.70	-10	64
" 2.....	59	28.0	11.0	17.0	11	0.40	0.80	138	62	76	144	536	326	210	196	0.68	-17	60
" 3.....	59	21.0	8.8	12.2	13	0.10	0.42	99	37	62	108	416	296	120	252	1.20	-5	64
" 4.....	58	14.0	7.9	6.1	14	0.04	0.38	65	34	31	52	232	188	44	188	1.20	15	38
5.....	59	21.0	14.0	7.0	11	0.20	1.10	123	62	61	132	288	170	118	200	1.10	-15	42
" 6.....	58	24.0	13.0	11.0	11	0.20	1.00	115	63	52	142	378	206	172	260	2.60	-12	48
" 7.....	58	24.0	11.0	13.0	12	0.24	0.86	130	68	62	124	438	276	162	244	1.70	-6	49
8.....	58	25.0	14.0	11.0	10	0.24	0.76	120	54	66	156	506	288	218	244	1.20	-20	67
" 9.....	58	29.0	13.0	16.0	11	0.30	0.90	118	63	55	124	424	224	200	200	1.10	-12	51
" 10.....	57	21.0	11.0	10.0	12	0.24	0.63	126	70	56	114	646	340	306	216	0.93	-22	69
" 11.....	56	18.0	12.0	6.0	14	0.08	0.24	74	35	39	53	176	120	56	158	3.50	28	38
" 12.....	57	27.0	13.0	14.0	11	0.20	0.80	126	62	64	116	562	332	230	200	....	-17	74
" 13.....	58	19.0	12.0	7.0	11	0.22	1.10	97	50	47	138	296	162	134	200	1.00	-16	51
" 14.....	57	26.0	16.0	9.0	11	0.28	0.82	108	66	42	138	290	164	126	188	3.10	-23	46
" 15.....	57	22.0	13.0	9.0	11	0.28	0.82	104	48	56	122	304	180	124	200	1.60	-17	50
" 16.....	57	28.0	15.0	13.0	12	0.28	1.00	124	62	62	124	660	302	358	200	0.00	-23	64
" 17.....	57	21.0	13.0	8.0	10	0.32	0.88	94	66	28	122	230	132	98	204	3.40	-16	30
" 18.....	56	16.0	5.0	10.0	15	0.08	0.34	70	20	50	54	68	34	34	218	6.90	21	..
" 19.....	58	24.0	15.0	9.0	12	0.36	0.74	106	69	37	164	390	186	114	204	1.40	-19	59
" 20.....	57	31.0	15.0	16.0	11	0.40	0.47	124	66	58	192	442	268	174	240	3.40	-17	56
" 21.....	56	33.0	14.0	19.0	12	0.60	0.70	138	59	79	180	748	370	378	200	0.00	-23	84
" 22.....	56	27.0	12.0	15.0	12	0.60	0.50	115	55	60	180	444	282	162	204	0.10	-17	56
" 23.....	56	21.0	12.0	9.0	12	0.55	0.22	100	52	48	160	230	150	80	216	....	-18	36
" 24.....	58	23.0	12.0	11.0	13	0.35	0.47	118	56	62	148	410	238	172	232	1.80	-10	46
" 25.....	55	18.0	4.9	13.0	13	0.05	0.27	61	25	56	55	174	150	24	196	3.90	32	27
" 26.....	58	24.0	12.0	12.0	11	0.10	0.77	120	57	63	136	546	280	266	200	6.00	-17	35
" 27.....	57	20.0	5.5	14.5	13	0.24	0.08	99	50	49	146	274	200	74	252	4.50	-10	54
" 28.....	56	22.0	9.1	12.9	11	0.30	0.52	113	54	59	118	444	266	178	236	2.70	-11	64
" 29.....	56	19.0	8.7	10.3	13	0.25	0.37	113	47	66	146	200	140	60	232	1.80	-18	49
" 30.....	57	21.0	7.1	13.9	13	0.10	0.37	112	53	59	130	356	244	112	240	2.60	-11	54
" 31.....	56	17.0	5.9	11.9	15	0.16	0.36	110	25	85	122	376	278	98	232	1.20	-10	59
Average..	57	22.8	11.2	11.6	12	0.26	0.60	110	54	56	128	384	229	155	215	2.15	-10	53

Date 1908	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Parts per Million																		
Nov. 1....	53	12.0	4.0	8.0	17	0.08	0.29	61	26	35	51	122	94	28	204	1.3	13	30
" 2....	51	20.0	9.0	11.0	15	0.12	0.45	113	45	68	124	330	198	132	248	3.2	-19	58
" 3...	50	14.0	7.1	6.9	14	0.08	0.64	76	28	48	106	224	170	54	212	2.0	7	41
" 4....	55	28.0	12.0	16.0	12	0.35	0.75	113	50	63	140	408	260	148	196	1.4	-20	55
5...	54	33.0	15.0	18.0	16	0.20	1.10	129	66	63	132	638	126	512	200	0.43	-40	30
" 6....	53	31.0	15.0	16.0	11	0.32	0.78	117	57	60	166	556	282	274	208	0.93	-28	60
" 7....	53	29.0	12.0	17.0	13	0.35	0.65	108	52	56	164	562	342	220	204	0.19	-29	62
8....	52	16.0	8.6	7.4	16	0.10	0.09	76	38	38	60	200	166	34	180	2.7	16	27
" 9...	53	26.0	12.0	14.0	13	0.40	0.47	108	52	56	162	328	206	122	244	0.31	-24	49
" 10....	54	19.0	11.0	8.0	14	0.30	0.80	97	66	31	174	270	156	114	300	1.6	-19	31
11....	53	21.0	13.0	8.0	12	0.55	0.55	97	52	45	146	232	146	86	196	2.2	-17	34
" 12....	52	31.0	15.0	16.0	13	0.50	0.37	118	54	64	158	516	286	230	232	....	-20	63
" 13....	52	22.0	14.0	8.0	11	0.55	0.45	92	48	44	152	220	156	64	204	3.3	-16	42
" 14....	51	20.0	10.0	10.0	12	0.10	0.62	95	54	41	156	238	176	62	228	1.8	-9	44
" 15....	50	14.0	6.5	7.5	15	0.04	0.22	58	23	35	49	162	134	28	186	1.9	35	24
16....	51	26.0	16.0	10.0	12	0.30	1.00	114	57	57	170	450	266	184	240	0.81	-34	91
" 17....	51	32.0	12.0	20.0	12	0.24	1.10	117	57	60	194	492	308	184	256	1.6	-20	86
" 18...	51	23.0	11.0	12.0	13	0.25	0.75	112	48	64	152	418	262	156	260	0.62	-16	78
" 19....	51	19.0	9.0	10.0	13	0.35	0.65	112	46	66	142	352	246	106	256	1.6	-9	60
" 20....	51	26.0	16.0	10.0	14	0.45	0.75	113	54	59	160	458	250	208	240	1.2	-17	60
" 21...	51	24.0	12.0	12.0	12	0.55	0.45	106	42	64	130	378	266	112	248	0.93	-13	67
" 23....	52	22.0	13.0	9.0	14	0.50	0.37	110	45	65	152	610	296	314	480	0.50	-32	87
24...	52	24.0	9.2	15.0	16	0.30	0.27	119	53	66	168	608	370	238	572	0.37	-30	90
" 25....	52	30.0	13.0	17.0	14	0.40	0.47	81	48	33	198	594	324	270	492	....	-48	71
" 26....	51	10.0	3.8	6.2	15	0.50	0.32	55	18	37	78	150	120	30	380	0.52	19	36
" 27....	52	37.0	13.0	24.0	15	0.35	0.75	146	56	90	188	660	314	346	544	0.0	-74	104
" 28....	52	20.0	12 0	8.0	13	0.26	1.10	106	56	50	152	270	130	140	392	1.1	-39	45
" 29...	50	9.2	4.4	4.8	16	0.20	0.73	45	25	20	58	140	110	30	368	4.1	16	28
" 30....	51	32.0	15.0	17.0	13	0.40	1.00	128	61	67	206	784	360	424	436	1.6	-149	...
Average	52	23.1	11.2	11.9	14	0.31	0.62	100	47	53	141	392	225	167	290	1.42	-21	55

Date 1908	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved	Carbonic Acid	Fats
Dec. 1....	56	22.0	16.0	6.0	11.0	0.25	1.25	104	57	47	186	390	202	194	192	0.0	−22	48.4
" 2....	51	25.0	16.0	9.0	11.0	0.20	1.00	101	54	47	214	324	190	134	176	0.4	−17	....
" 3....	50	24.0	15.0	9.0	12.0	0.30	0.70	106	58	48	256	294	180	114	188	1.4	−24	66.6
" 4....	50	32.0	14.0	18.0	11.0	0.35	0.95	101	54	47	276	400	172	228	194	1.3	−54	....
5....	50	17.0	12.0	5.0	9.4	0.25	2.25	85	48	37	174	1148	832	316	210	0.0	−91	26.0
" 6....	47	7.8	5.4	2.4	15.0	0.45	0.65	44	23	21	61	120	100	220	190	...	9	....
" 7....	49	22.0	11.0	11.0	9.7	0.25	1.05	88	40	48	132	356	214	142	190	0.7	−18	42.4
" 8...	49	20.0	13.0	7.0	11.0	0.55	0.95	89	52	37	180	200	138	62	222	1.1	−17	....
" 9....	50	23.0	13.0	10.0	13.0	0.70	0.40	100	53	47	218	302	214	88	224	0.6	−12	49.0
" 10....	49	13.0	11.0	2.0	12.0	0.60	0.50	90	52	38	192	202	146	56	226	2.3	−10	....
11....	49	18.0	8.8	9.2	14.0	0.40	0.30	94	47	47	214	230	158	72	196	2.1	−11	28.0
" 12...	49	21.0	10.0	11.0	11.0	0.25	2.65	97	56	41	192	236	148	78	196	0.7	−17	....
" 13....	48	14.0	7.2	6.8	14.0	0.10	0.70	56	21	35	56	82	49	33	180	4.6	16	64.0
14...	49	30.0	10.0	20.0	14.0	0.30	0.80	110	50	60	174	534	352	182	234	2.3	−10	....
" 15....	49	19.0	12.0	7.0	11.0	0.20	1.00	84	44	40	158	164	122	42	204	0.9	−7	37.0
" 16....	49	20.0	11.0	9.0	14.0	0.30	0.60	86	44	42	166	186	134	52	222	2.0	−13	....
" 17....	49	22.0	11.0	11.0	14.0	0.40	....	84	44	40	158	230	166	64	228	1.0	−10	34.0
" 18....	49	18.0	13.0	5.0	15.0	0.30	....	80	44	36	168	190	124	66	250	0.7	−13	....
" 19....	48	19.0	11.0	8.0	15.0	0.05	....	78	40	38	158	234	152	82	234	2.4	−4	24.0
" 20...	47	10.0	7.0	3.0	15.0	0.10	0.50	38	18	20	56	88	86	2	174	5.6	13	....
" 21....	48	24.0	15.0	9.0	14.0	0.25	1.15	95	54	41	190	326	210	116	210	1.1	−23	79.0
" 22....	48	26.0	20.0	6.0	12.0	0.30	1.20	98	49	49	218	490	280	210	214	1.2	−16	....
" 23....	48	19.0	13.0	6.0	11.0	0.30	0.90	92	52	40	188	276	178	98	208	1.2	−15	45.0
" 24....	48	19.0	6.0	13.0	16.0	0.05	0.00	92	43	49	198	330	230	100	268	1.0	−6	....
" 25...	47	11.0	6.4	4.6	15.0	0.10	0.40	49	24	25	66	158	138	20	170	0.8	12	47.0
" 26....	48	25.0	14.0	11.0	15.0	0.45	0.85	87	42	45	140	260	200	60	244	0.4	−9	....
" 27....	46	13.0	9.2	3.8	17.0	0.10	0.50	54	23	31	48	146	134	12	180	3.0	−12	53.0
" 28....	48	29.0	14.0	15.0	11.0	0.35	1.05	104	54	50	166	436	276	160	224	1.0	−32	....
29....	48	25.0	15.0	10.0	12.0	0.35	1.15	108	60	48	164	428	258	170	200	0.9	−30	52.0
" 30....	48	30.0	18.0	12.0	11.0	0.30	1.30	102	56	46	168	392	244	148	192	0.6	−28	....
" 31...	48	25.0	16.0	9.0	13.0	0.20	1.40	100	57	43	180	250	194	56	208	1.6	−14	....
Average	49	20.7	12.0	8.7	12.9	0.29	0.93	87	46	41	165	304	201	103	208	1.4	−16	46.4

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Jan. 2	48	28.0	19.0	9.0	13.0	0.25	0.62	99	52	47	114	292	198	94	220	1.70	-27	49
” 3	45	10.0	6.2	3.8	16.0	0.40	0.58	45	22	23	48	120	106	14	164	5.30	14	..
” 4	48	31.0	15.0	16.0	14.0	0.20	0.90	98	56	42	200	362	226	136	216	5.10	-40	28
5	48	26.0	18.0	8.0	9.0	0.20	2.50	107	60	47	160	354	210	144	204	1.60	-33	..
” 6	47	22.0	16.0	6.0	10.0	0.30	3.00	95	57	38	160	248	150	98	204	4.00	-20	32
” 7	46	22.0	15.0	7.0	9.4	0.20	1.50	102	56	46	158	266	164	102	208	1.20	-27	..
8	46	22.0	16.0	6.0	10.0	0.20	1.50	84	48	36	146	190	150	40	200	5.20	-17	30
9	47	22.0	14.0	8.0	11.0	0.20	1.60	96	56	40	174	226	152	74	236	3.20	-24	..
” 10	45	11.0	4.6	6.4	17.0	0.40	0.70	42	26	16	54	164	134	30	196	4.50	15	44
” 11	47	25.0	18.0	7.0	12.0	0.45	0.95	111	60	51	192	466	282	184	240	0.90	-27	..
” 12	48	24.0	19.0	5.0	11.0	0.55	0.65	109	65	44	232	318	184	134	220	1.20	-22	56
” 13	48	23.0	15.0	8.0	11.0	0.55	0.85	101	58	43	186	290	200	90	212	0.10	-20	..
14	48	24.0	13.0	11.0	13.0	0.40	1.40	110	54	56	182	426	268	158	200	0.37	-20	46
” 15	48	24.0	18.0	6.0	12.0	0.20	0.32	107	62	45	196	218	158	60	216	0.50	-21	..
16	47	27.0	15.0	12.0	13.0	0.10	1.10	108	55	53	228	248	170	78	236	1.30	-10	33
” 17	46	14.0	9.6	4.4	16.0	0.20	1.30	58	24	34	62	122	52	70	188	5.10	12	..
” 18	47	32.0	18.0	14.0	12.0	0.30	0.80	110	65	45	222	412	242	170	200	1.80	-28	43
” 19	46	29.0	22.0	7.0	9.4	0.30	0.80	105	53	52	180	454	286	168	200	0.00	-28	..
20	47	28.0	17.0	11.0	11.0	0.30	0.80	114	58	56	214	444	274	170	248	1.90	-28	58
” 21	47	27.0	16.0	11.0	11.0	0.20	1.10	106	56	50	196	318	222	96	236	0.81	-30	..
” 22	47	44.0	23.0	21.0	12.0	0.40	1.10	136	71	65	302	764	404	360	248	0.00	-56	68
” 23	47	32.0	16.0	16.0	11.0	0.40	1.10	126	62	64	248	616	294	322	200	1.70	-67	..
” 24	45	13.0	7.8	5.2	13.0	0.40	0.70	60	31	29	52	168	114	54	168	1.20	8	47
” 25	46	28.0	16.0	12.0	9.7	0.55	1.80	115	59	56	188	524	300	224	200	3.80	-21	..
” 26	46	30.0	17.0	13.0	9.7	0.45	1.90	126	66	60	202	772	392	380	212	3.50	-30	64
” 27	47	30.0	16.0	14.0	10.0	0.45	1.30	122	68	54	222	472	252	220	236	3.10	-19	..
” 30	47	23.0	17.0	6.0	13.0	0.20	0.12	119	58	61	206	398	278	120	268	1.70	-9	49
” 31	45	11.0	6.6	4.4	15.0	0.55	0.65	63	35	28	54	154	114	40	172	5.60	10	..
Average	47	24.0	15.0	9.2	11.9	0.33	1.13	99	53	46	171	350	213	137	212	2.40	-20	46

Parts per Million

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Feb. 1	47	33.0	20.0	13.0	11.0	0.35	0.95	139	61	78	202	706	376	330	240	1.2	-37	63
" 2	47	34.0	20.0	14.0	12.0	0.45	0.65	157	64	93	224	862	480	382	220	1.2	-38	..
4	47	34.0	20.0	14.0	12.0	0.40	1.20	138	63	75	234	750	432	318	228	1.3	-36	85
" 5	47	29.0	15.0	14.0	10.0	0.30	0.90	124	62	62	250	530	254	276	208	1.8	-46	..
6	46	26.0	13.0	13.0	14.0	0.20	0.00	124	48	76	226	548	366	182	252	1.3	-13	77
" 7	44	13.0	3.0	10.0	14.0	0.35	0.85	69	31	38	57	268	236	38	176	3.1	14	..
" 8	46	32.0	17.0	15.0	12.0	0.40	0.60	151	52	99	228	812	464	348	252	1.5	-36	84
" 9	46	34.0	22.0	12.0	12.0	0.55	0.45	148	61	87	254	582	360	222	228	0.7	-30	..
10	46	32.0	19.0	13.0	10.0	0.70	0.70	136	62	74	242	646	330	316	240	0.5	-53	66
11	46	28.0	20.0	8.0	10.0	0.50	1.20	134	61	73	220	508	290	218	232	1.7	-35	..
" 12	46	31.0	21.0	10.0	12.0	0.50	0.50	130	62	68	250	440	292	148	244	0.2	-36	57
" 13	47	34.0	15.0	19.0	11.0	0.55	1.05	140	58	82	204	680	354	326	236	1.7	-18	..
" 14	45	21.0	12.0	9.0	14.0	0.25	0.75	77	36	41	62	240	196	44	204	2.5	10	60
" 15	46	25.0	15.0	10.0	12.0	0.30	0.80	122	63	59	192	278	182	96	220	2.4	-18	..
" 16	45	18.0	9.4	8.6	13.0	0.30	1.30	87	51	36	134	338	124	214	212	6.1	-2	72
' 17	45	22.0	16.0	6.0	11.0	0.30	1.40	99	58	41	194	398	164	234	204	1.6	-52	..
" 18	46	25.0	17.0	8.0	12.0	0.25	1.80	102	56	46	198	412	232	174	220	2.2	-23	17
" 19	47	24.0	15.0	9.0	10.0	0.40	1.40	112	52	60	150	386	234	152	248	3.1	-23	..
" 20	41	8.4	3.6	4.8	6.0	0.35	.00	81	22	59	54	536	176	360	180	8.8	4	25
" 21	42	8.4	1.2	7.2	10.0	0.40	2.70	44	21	23	42	170	138	32	164	7.3	11	..
' 22	45	22.0	15.0	7.0	10.0	0.70	2.20	88	46	42	110	456	228	228	236	2.7	-15	17
" 27	45	12.0	7.6	4.4	9.4	0.45	0.80	81	35	46	114	200	120	80	220	3.8	-1	..
" 28	44	11.0	4.2	6.8	9.4	1.10	1.4	42	25	17	64	70	68	2	180	3.7	7	25
Average	46	24.2	14.0	10.2	11.2	0.44	1.03	110	50	60	170	470	265	205	219	2.6	-20	54

Parts per Million

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Mch. 1.....	46	17.0	14.0	3.0	11.0	0.80	1.70	99	53	46	174	260	196	64	200	0.4	-8	50
" 2.....	46	20.0	17.0	3.0	8.7	0.30	0.90	92	56	36	142	260	162	98	196	2.1	-12	..
3.....	45	22.0	15.0	7.0	10.0	0.35	1.80	95	58	37	166	286	198	88	220	3.3	-8	41
4.....	45	20.0	14.0	6.0	10.0	0.80	1.20	93	58	35	186	254	180	74	196	1.9	-15	..
5.....	45	24.0	20.0	4.0	10.0	0.70	1.60	91	52	39	170	230	138	92	204	3.6	-15	48
6.....	45	24.0	15.0	9.0	12.0	0.10	0.20	101	50	51	174	284	218	66	280	2.4	-9	..
" 7.....	44	13.0	10.0	3.0	14.0	0.80	0.50	54	20	34	50	158	136	22	172	4.2	16	63
8.....	45	34.0	26.0	8.0	12.0	0.55	1.40	114	55	59	198	656	404	252	224	4.2	-15	..
9.....	45	23.0	17.0	6.0	11.0	0.30	0.90	93	54	39	172	266	184	82	212	2.7	-14	52
10.....	46	25.0	20.0	5.0	12.0	0.45	2.20	86	48	38	140	208	128	80	200	4.2	-14	..
11.....	45	24.0	17.0	7.0	9.0	0.80	1.00	85	52	33	152	198	144	54	228	4.0	-10	52
12.....	45	23.0	16.0	7.0	12.0	1.00	0.90	95	46	49	172	348	178	170	220	3.6	-17	..
13.....	45	16.0	8.8	7.2	16.0	0.05	0.00	76	36	40	132	228	152	76	256	2.2	-0.4	29
14.....	44	11.0	5.8	4.2	15.0	0.20	1.60	43	22	21	50	116	76	40	180	5.6	12	..
15.....	45	22.0	11.0	11.0	12.0	0.90	0.20	86	46	40	144	324	214	110	256	4.4	-13	51
16.....	45	17.0	12.0	5.0	13.0	0.90	0.80	76	39	37	152	222	136	86	204	4.3	-12	..
17.....	47	17.0	10.0	7.0	12.0	0.90	0.60	82	39	43	160	216	132	84	200	3.8	-13	46
18.....	45	29.0	17.0	12.0	13.0	0.70	0.70	83	45	38	142	268	156	112	248	4.4	-11	..
19.....	45	16.0	12.0	4.0	13.0	0.50	1.10	87	46	41	136	232	136	96	236	3.4	-12	37
20.....	45	15.0	6.6	8.4	15.0	0.30	0.00	76	39	37	102	220	144	76	216	4.1	-0.4	..
21.....	44	10.0	8.0	2.0	12.0	0.20	1.90	52	23	29	44	242	88	154	164	5.5	8	38
22.....	44	25.0	19.0	6.0	9.4	0.30	1.40	91	50	41	106	350	184	166	188	6.2	-20	..
23.....	42	19.0	16.0	3.0	9.0	0.30	2.40	85	50	35	108	252	132	120	228	3.2	-21	42
24.....	43	19.0	14.0	5.0	7.7	0.25	2.40	80	42	38	102	220	118	102	188	3.4	-14	..
25.....	44	17.0	12.0	5.0	7.0	0.35	1.70	62	30	32	88	224	116	108	200	3.5	-24	36
26.....	44	16.0	12.0	4.0	12.0	0.55	1.80	83	41	42	106	200	144	56	216	4.7	-8	..
27.....	46	16.0	11.0	5.0	12.0	0.70	0.20	81	37	44	106	182	130	52	248	3.2	-5	37
28.....	43	8.6	5.4	3.2	11.0	0.50	1.90	42	17	25	33	144	82	62	156	3.2	8	..
29.....	44	21.0	11.0	10.0	7.0	0.50	2.80	91	51	40	110	434	184	250	208	3.7	-13	45
30.....	44	19.0	14.0	5.0	7.0	0.45	2.30	82	39	43	92	330	164	166	208	3.4	-8	..
31.....	42	21.0	13.0	8.0	6.4	0.50	2.50	85	41	44	88	528	200	328	192	4.2	-10	35
Average..	45	19.4	13.5	5.9	11.0	0.52	1.30	82	43	39	126	269	160	109	211	3.6	-9	44

Parts per Million

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Free Ammonia.	Nitrites.	Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
Apr. 1.....	43	16.0	13.0	3.0	6.0	0.55	2.25	80	36	44	82	666	172	494	192	4.6	−16	..
" 2.....	43	15.0	8.6	6.4	7.0	0.80	1.20	60	24	36	92	318	134	184	192	3.8	−10	25
3.....	43	16.0	7.8	8.2	7.0	1.10	1.20	94	43	51	90	250	148	102	220	2.6	−5	..
4.....	42	11.0	4.4	6.6	6.4	0.55	2.45	46	24	22	34	122	84	38	160	6.0	11	25
" 5.....	43	17.0	11.0	6.0	6.4	0.45	2.15	82	40	42	84	426	226	200	160	2.3	−13	..
6.....	44	18.0	11.0	7.0	6.0	0.45	2.15	66	36	30	112	262	140	122	188	2.8	−15	17
" 7.....	44	13.0	11.0	2.0	4.0	0.50	1.70	68	28	40	88	232	114	118	164	4.8	−13	..
8.....	43	18.0	11.0	7.0	7.3	0.70	1.80	70	35	35	118	188	114	74	208	2.7	−10	28
" 9.....	45	20.0	14.0	6.0	8.0	0.80	1.20	72	40	32	118	194	136	58	228	2.3	−10	..
" 10.....	45	9.2	6.8	2.4	12.0	2.60	0.00	73	48	25	104	154	120	34	220	4.2	−0.4	18
" 11.....	45	8.6	6.2	2.4	11.0	0.55	1.75	70	31	39	45	92	86	6	180	4.7	4	..
12.....	45	19.0	15.0	4.0	9.4	0.60	1.10	81	48	33	122	188	128	66	216	3.0	−13	42
13.....	46	18.0	14.0	4.0	9.7	0.80	1.00	80	47	33	130	172	126	46	232	2.3	−13	..
14.....	46	15.0	11.0	4.0	6.0	0.40	1.60	72	33	39	106	186	112	74	188	3.1	−11	14
15.....	45	17.0	8.9	8.1	5.7	0.55	3.25	88	34	54	92	300	160	140	184	4.6	−9	..
" 16.....	46	15.0	10.0	5.0	8.4	0.80	1.50	84	41	43	142	478	220	258	212	3.2	−15	11
" 17.....	46	25.0	12.0	13.0	10.0	0.80	2.40	83	32	51	130	464	246	218	200	0.8	−0.4	..
18.....	46	7.6	5.2	2.4	10.0	0.40	2.80	67	31	36	46	84	68	16	184	...	22	32
" 19.....	48	23.0	15.0	8.0	8.4	0.40	3.00	82	47	35	134	296	152	144	188	3.0	−15	..
" 20.....	46	26.0	17.0	9.0	9.0	0.25	1.85	95	59	36	126	508	204	304	204	1.5	−18	56
" 21.....	47	25.0	12.0	13.0	9.7	0.40	2.10	95	44	51	130	582	228	354	208	3.7	−12	..
" 22.....	47	32.0	15.0	17.0	11.0	0.40	1.80	102	48	54	126	626	286	340	192	1.4	−19	83
" 23.....	47	32.0	16.0	16.0	10.0	0.50	1.90	136	48	88	134	988	434	554	176	1.5	−15	..
24.....	47	29.0	12.0	17.0	16.0	3.20	0.00	110	44	66	146	558	314	244	264	2.5	−0.4	54
25.....	46	11.0	5.8	5.2	11.0	1.60	0.50	48	20	28	60	170	118	52	200	4.3	6	..
26.....	47	31.0	16.0	15.0	10.0	0.35	1.25	106	50	56	154	680	344	336	204	3.0	−16	80
" 27.....	49	26.0	19.0	7.0	11.0	0.45	1.85	102	50	52	188	564	266	298	200	4.5	−20	..
28....	48	25.0	18.0	7.0	11.0	0.55	1.65	101	49	52	212	390	212	178	212	3.8	−16	42
" 29.....	49	30.0	19.0	11.0	10.0	0.55	1.55	110	44	66	198	738	344	394	200	2.9	−16	..
" 30.....	48	29.0	14.0	15.0	8.0	0.45	1.40	116	40	76	148	886	392	494	208	4.9	−14	33
Average.	46	19.9	12.0	7.9	8.8	0.75	16.80	85	40	45	116	392	194	198	200	3.3	−9	37

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved	Carbonic Acid	Fats
May 1..	47	19	11.0	8.0	8.7	1.80	0.10	81	36	45	138	363	184	152	112	5.6	−.4	33
" 2..	47	11	4.7	6.3	9.7	0.60	1.50	42	16	26	50	180	136	44	200	4.2	5	..
" 3..	47	34	16.0	18.0	9.0	0.50	2.00	122	46	76	170	1024	416	618	212	1.7	−18	39
4..	48	28	11.0	17.0	8.7	0.65	1.40	99	49	50	160	522	244	278	220	1.4	−15	..
" 5..	48	29	15.0	14.0	11.0	0.90	1.40	106	59	47	196	492	234	258	228	0.0	−14	46
" 6..	49	33	18.0	15.0	9.4	0.60	0.60	104	51	53	194	666	268	398	200	2.1	−23	..
" 7..	50	29	16.0	13.0	9.4	0.60	1.00	97	50	47	148	414	204	210	196	3.6	−20	35
8..	49	23	13.0	10.0	11.0	1.20	1.00	90	39	51	160	304	162	142	224	3.2	−.4	..
9..	49	13	7.2	5.8	12.0	0.50	1.70	46	17	29	54	136	116	20	180	6.7	8	22
" 10..	51	23	17.0	6.0	8.4	0.30	1.70	90	46	44	144	528	184	344	216	2.9	−27	..
" 11..	51	26	16.0	10.0	9.0	0.50	2.20	99	44	55	172	600	238	362	172	1.5	−20	23
" 12..	50	26	18.0	8.0	9.7	0.45	2.10	104	52	52	186	542	224	318	192	3.0	−19	..
13..	52	28	15.0	13.0	11.0	0.50	1.80	104	48	56	188	684	272	412	204	0.5	−39	28
14..	52	32	17.0	15.0	10.0	0.35	1.40	111	50	61	222	562	268	294	220	1.0	−29	..
" 15..	51	28	15.0	13.0	12.0	1.20	0.10	102	40	62	192	530	290	240	244	2.4	−4	39
" 16..	50	12	4.8	7.2	12.0	0.30	0.60	51	14	37	58	330	172	158	244	7.3	12	..
" 17..	52	32	16.0	16.0	10.0	0.55	2.20	89	44	45	176	690	298	392	232	2.4	−20	18
" 18..	52	24	16.0	8.0	10.0	0.50	1.70	98	46	52	192	402	224	178	200	1.9	−12	..
" 19..	52	31	16.0	15.0	11.0	0.60	1.90	111	48	63	212	588	278	310	240	1.6	−14	25
" 20..	53	33	16.0	17.0	8.4	0.45	1.10	111	49	62	172	894	318	576	200	1.4	−3.3	..
" 21..	53	31	17.0	14.0	9.7	0.60	1.00	106	50	56	218	728	298	430	204	1.0	−3.9	30
" 22..	52	21	12.0	9.0	12.0	1.60	0.00	88	37	51	178	274	178	96	216	2.2	−4	..
" 23..	51	17	7.8	9.2	14.0	0.25	1.10	58	22	36	60	262	180	82	216	0.0	8	37
" 24..	52	28	15.0	13.0	13.0	0.55	0.85	106	53	53	206	576	254	322	200	1.0	−13	..
" 25..	53	28	15.0	13.0	13.0	0.45	1.20	106	55	51	204	450	236	214	220	8.2	−23	36
" 26..	53	28	19.0	9.0	12.0	0.35	0.85	108	58	50	202	342	210	132	240	0.8	−15	..
" 27..	53	49	16.0	33.0	11.0	0.45	1.30	110	51	59	180	712	282	430	220	0.1	−3.7	43
" 28..	54	35	16.0	19.0	11.0	0.40	1.10	112	51	61	222	692	320	372	200	0.0	−19	..
Average.	51	26.8	14.2	12.6	10.6	0.63	1.25	95	44	51	166	517	239	278	213	2.4	−11.7	32

Date 1909	Temp. Deg. F.	Nitrogen. Organic. Total.	Nitrogen. Organic. Dissolved.	Nitrogen. Organic. Suspended.	Free Ammonia.	Nitrites.	Nitrates.	Oxygen Consumed. Total.	Oxygen Consumed. Dissolved.	Oxygen Consumed. Suspended.	Chlorine.	Suspended Matter. Total.	Suspended Matter. Volatile.	Suspended Matter. Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.	Carbonic Acid	Fats
						Parts per Million												
June 1.....	55	27	18.0	9.0	12	0.25	1.45	100	51	49	210	296	184	112	240	1.7	–15	58
" 2.....	55	33	21.0	12.0	13	0.30	1.10	109	54	55	218	324	190	134	240	1.8	–23	41
" 3.....	56	31	19.0	12.0	12	0.55	1.05	98	52	46	228	250	164	86	232	2.9	–8	41
" 4.....	56	27	19.0	8.0	12	0.35	0.85	99	50	49	198	312	196	116	232	1.8	–14	51
" 5.....	56	46	13.0	33.0	12	0.70	0.00	106	37	69	158	622	254	368	240	2.4	–.4	..
6.....	54	11	3.8	7.3	14	0.30	0.60	35	19	16	60	176	146	30	200	...	17	26
" 7.....	55	33	19.0	14.0	14	0.80	0.60	105	49	56	224	548	256	292	224	2.4	–13	..
8.....	56	43	23.0	20.0	12	0.55	0.95	108	56	52	240	646	250	396	216	2.6	–42	41
" 9.....	56	41	20.0	20.8	13	1.00	0.40	110	54	56	238	612	340	272	232	0.7	–13	..
" 10.....	56	34	17.0	17.0	11	0.70	0.70	116	54	62	184	696	288	408	228	0.1	–36	33
" 11.....	57	32	17.0	15.0	12	0.55	0.75	123	53	70	210	1312	354	958	224	1.4	–17	..
" 12.....	56	24	11.0	13.0	15	0.80	0.00	104	44	60	172	584	286	298	232	2.3	–.4	35
13.....	56	20	11.0	9.0	14	0.20	0.60	66	30	36	56	362	162	200	180	...	20	..
" 14.....	57	28	18.0	10.0	11	0.40	0.90	97	60	37	178	456	220	236	228	2.9	–11	73
" 15.....	56	26	15.0	11.0	12	0.90	0.70	98	44	54	188	728	226	502	225	2.7	–7	..
16.....	57	34	17.0	17.0	12	0.90	0.60	118	54	64	214	1012	320	692	232	2.5	–11	16
" 17.....	56	37	16.0	21.0	12	0.55	0.05	129	55	74	212	1000	454	546	212	0.7	–11	..
" 18.....	57	48	18.0	30.0	13	0.70	0.70	106	51	55	182	616	292	324	228	2.7	–17	37
19.....	55	26	12.0	14.0	15	0.55	0.00	99	47	52	172	440	252	188	260	4.3	–5	..
" 20.....	55	23	13.0	10.0	20	0.00	0.05	42	35	7	65	184	152	32	204	1.5	53	52
21.....	57	41	15.0	26.0	13	0.45	0.55	130	50	80	204	918	408	510	248	0.7	–11	..
" 22.....	58	32	17.0	15.0	13	0.40	0.50	111	55	56	174	494	264	230	260	1.2	–8	34
" 23.....	59	37	18.0	19.0	11	0.50	0.70	110	48	62	202	500	248	252	224	2.1	–15	..
" 24.....	61	32	17.0	15.0	12	0.80	0.60	103	56	47	244	538	308	230	240	2.3	–12	66
" 25.....	60	31	17.0	14.0	13	0.25	0.65	102	48	54	250	466	276	190	240	2.1	–10	..
" 26.....	58	25	13.0	12.0	15	0.05	0.75	93	46	47	224	378	236	142	292	1.1	–2	41
27.....	59	23	13.0	12.0	17	0.03	0.18	65	26	39	82	216	176	40	200	2.9	45	..
" 28.....	61	26	7.3	19.0	14	0.05	0.15	72	24	48	112	500	232	268	216	2.8	–12	53
29.....	59	26	14.0	12.0	15	0.20	0.78	96	50	46	268	332	208	124	240	2.5	–6	..
" 30.....	60	30	12.0	18.0	18	0.22	0.55	104	47	57	260	570	368	202	252	1.2	–10	70
Average....	57	31	15.5	15.5	13	0.47	0.58	98	46	52	188	536	257	279	231	2.0	–5.9	45

Appendix E.

Results of Chemical Analyses of Effluent from Grit Chamber.

Date 1908	Parts per Million													
	Nitrogen						Oxygen Consumed				Suspended Matter			
	Organic													
	Total	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Chlorine	Total	Volatile	Fixed	Alkalinity in Terms of Ca Co 3
May 27.....	15.0	12.0	3.0	8.0	0.25	1.19	63	36	27	112	80	72	8	176
" 28.....	19.0	11.0	8.0	9.0	1.30	0.44	63	32	31	94	158	106	52	184
" 29.....	13.0	8.6	4.4	10.0	0.25	0.06	65	35	30	94	230	130	100	194
" 30.....	7.8	2.1	5.7	10.0	0.10	0.37	29	13	16	42	...	...	...	158
" 31.....	8.4	2.0	6.4	11.0	0.05	0.82	25	11	14	40	79	63	16	160
Average...	13.0	7.1	5.5	9.6	0.39	0.57	49	25	24	76	137	93	44	174

Date 1908	Parts per Million													
	Nitrogen						Oxygen Consumed				Suspended Matter			
	Organic													
	Total	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Chlorine	Total	Volatile	Fixed	Alkalinity in Terms of Ca Co 3
June 3.....	17.0	10.0	7.0	9.0	0.23	1.31	50	21	29	120	146	100	46	252
" 4.....	19.0	11.0	8.0	8.4	0.22	1.83	54	29	25	112	...	...	...	188
" 5.....	14.0	11.0	3.0	9.7	0.25	0.99	65	26	39	118	154	104	50	208
" 6.....	14.0	8.8	5.2	9.0	1.10	0.44	49	26	23	86	144	104	40	192
" 7.....	6.5	2.9	3.6	14.0	0.04	0.58	27	16	11	51	73	60	13	156
" 8.....	20.0	12.0	8.0	11.0	0.50	0.48	69	40	29	152	190	132	58	232
" 9.....	12.0	8.2	3.8	12.0	0.10	0.32	46	26	20	112	148	102	46	192
" 11.....	16.0	9.0	7.0	12.0	0.45	1.34	67	37	30	144	164	105	59	204
" 12.....	18.0	9.8	8.2	12.0	0.25	1.18	74	40	34	140	210	152	58	208
" 14.....	6.7	2.3	4.4	13.0	0.08	0.59	32	17	15	48	74	64	10	152
" 15.....	17.0	9.2	7.8	11.0	0.20	1.1	71	40	31	126	230	124	106	192
" 16.....	17.0	12.0	5.0	10.0	0.25	1.28	70	40	30	128	168	110	58	196
" 17.....	17.0	13.0	4.0	10.0	0.22	1.17	65	37	28	132	184	112	72	184
" 18.....	21.0	13.0	8.0	10.0	0.32	1.34	75	41	34	124	208	126	82	204
" 19.....	20.0	13.0	7.0	9.7	0.55	0.32	73	44	29	118	276	136	140	188
" 21.....	9.5	3.9	5.6	13.0	0.08	.54	32	16	16	51	83	71	12	160
" 22.....	18.0	12.0	6.0	12.0	0.30	1.03	74	43	31	136	208	156	52	228
" 23.....	26.0	15.0	11.0	12.0	0.40	0.07	93	40	53	128	484	204	280	200
" 24.....	18.0	7.2	11.0	13.0	0.09	0.35	82	32	50	124	448	210	238	200
" 25.....	25.0	7.6	17.0	15.0	0.04	0.48	108	40	68	152	546	302	244	256
" 26.....	16.0	6.8	9.2	15.0	0.05	0.62	72	31	41	136	240	144	96	208
" 28.....	12.0	5.3	6.7	14.0	0.05	0.00	46	16	30	58	192	148	44	160
" 29.....	20.0	8.4	12.0	15.0	....	....	79	38	41	128	266	176	90	228
" 30.....	24.0	11.0	13.0	16.0	0.05	.04	88	38	50	150	408	228	180	236
Average....	17.0	9.3	7.6	12.0	0.26	0.76	65	32	33	116	228	138	90	201

Date 1908	Nitrogen: Organic: Total	Nitrogen: Organic: Dissolved	Nitrogen: Organic: Suspended	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed: Total	Oxygen Consumed: Dissolved	Oxygen Consumed: Suspended	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3
	Parts per Million													
July 1.....	32.0	9.3	23.0	14.0	0.09	0.07	118	39	79	158	708	356	352	240
" 2.....	25.0	9.6	15.0	13.0	0.35	0.00	98	41	57	148	446	252	194	228
" 4.....	18.0	2.6	15.0	12.0	0.08	0.00	60	17	43	72	390	228	162	180
" 5.....	7.8	3.4	4.4	14.0	0.06	0.05	31	15	16	61	93	76	17	154
" 6.....	26.0	12.0	14.0	11.0	0.50	0.37	95	44	51	140	452	266	186	208
" 7.....	21.0	9.0	12.0	12.0	0.09	0.07	95	38	57	160	410	262	148	220
" 8.....	30.0	8.6	21.0	14.0	0.35	0.47	124	47	77	178	724	454	270	212
" 9.....	30.0	9.4	21.0	14.0	0.07	0.33	119	46	73	162	624	406	218	212
" 10.....	69.0	12.0	57.0	14.0	0.06	0.13	137	48	89	166	916	600	316	244
" 12.....	5.8	2.7	3.1	13.0	0.05	0.37	67	11	56	54	84	63	21	156
" 13.....	18.0	11.0	7.0	12.0	0.50	0.62	86	44	42	128	184	120	64	220
" 14.....	18.0	7.2	11.0	13.0	0.22	0.47	85	44	41	170	220	130	90	212
" 15.....	15.0	11.0	4.0	12.0	0.45	0.48	79	44	35	144	196	118	78	196
" 16.....	20.0	14.0	6.0	12.0	0.26	0.94	84	45	39	138	178	108	70	208
" 18.....	14.0	9.4	4.6	10.0	0.40	0.27	62	29	33	104	310	120	190	184
" 19.....	9.0	4.1	3.9	12.0	0.10	0.02	32	16	16	55	89	67	22	160
" 20.....	16.0	9.2	6.8	11.0	0.33	0.77	112	37	75	142	266	134	132	204
" 21.....	15.0	9.2	5.8	11.0	0.50	0.60	66	42	24	134	158	108	50	196
" 22.....	16.0	11.0	5.0	11.0	0.65	0.55	76	42	34	160	198	122	76	196
" 23.....	16.0	6.0	10.0	11.0	0.36	0.51	76	40	36	142	188	118	70	192
" 24.....	21.0	12.0	9.0	10.0	0.65	0.28	76	42	34	146	214	134	80	196
" 26.....	11.0	5.6	5.4	13.0	0.05	0.22	34	15	19	59	105	84	21	154
" 27.....	21.0	13.0	8.0	10.0	0.55	0.38	76	37	39	174	280	158	...	204
" 28.....	21.0	12.0	9.0	11.0	0.70	0.08	86	45	41	204	344	188	156	188
" 29.....	17.0	6.0	11.0	15.0	0.60	0.03	126	39	87	152	246	142	104	200
" 30.....	24.0	8.6	15.0	14.0	0.08	0.42	128	42	86	154	822	468	354	220
" 31.....	21.0	12.0	9.0	11.0	0.35	0.32	94	36	58	156	394	242	152	212
Average....	21.0	8.9	12.0	12.0	0.31	0.32	86	36	50	136	342	240	143	199

Appendix F.

Results of Chemical Analyses of Effluent from Septic Tank.

Date 1908	Parts per Million													
	Nitrogen						Oxygen Consumed				Suspended Matter			Alkalinity in Terms of Ca Co 3
	Organic													
	Total	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Chlorine	Total	Volatile	Fixed	
May 26.....	7.1	4.4	2.7	11	0.11	0.00	31	18	13	62	55	45	10	188
" 27.....	9.8	7.4	2.4	12	0.18	0.34	44	32	12	108	57	43	14	228
" 28.....	11.0	6.8	4.2	11	0.05	0.24	47	28	19	96	70	51	19	212
" 29.....	8.2	6.6	1.6	12	0.00	0.21	56	29	27	92	94	60	34	196
" 30.....	5.8	2.5	3.3	12	0.00	0.00	29	18	11	53	68	49	19	172
" 31.....	4.4	2.0	2.4	11	0.00	0.00	21	12	9	42	71	43	28	160
Average....	7.7	4.9	2.8	11	0.06	0.13	38	23	15	76	69	48	21	193

Date 1908	Parts per Million														
	Nitrogen						Oxygen Consumed				Suspended Matter			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
	Organic														
	Total	Dissolved	Suspended	Free Ammonia	Nitrites	Nitrates	Total	Dissolved	Suspended	Chlorine	Total	Volatile	Fixed		
June 1.....	5.4	3.0	2.4	10	0.00	0.01	14	10	4	49	50	44	6	172	0.00
" 2.....	10.0	7.6	2.4	11	0.14	0.07	30	22	8	72	75	60	15	204	0.08
" 3.....	11.0	5.8	5.2	12	0.35	0.02	30	19	11	99	70	55	15	216	0.60
" 4.....	13.0	7.4	5.6	12	0.14	0.99	35	22	13	108	75	53	22	220	....
" 5.....	10.0	6.2	3.8	14	0.14	0.28	39	24	15	120	79	59	20	220	0.00
" 6.....	9.6	4.8	4.8	13	0.10	0.09	41	27	14	92	60	48	12	210	0.06
" 7.....	5.7	4.1	1.6	14	0.00	0.42	24	17	7	66	43	36	7	172	1.70
" 9.....	8.8	6.4	2.4	13	0.16	0.00	35	30	5	114	62	49	13	200	....
" 10.....	9.8	8.2	1.6	12	0.22	0.00	47	27	20	98	63	48	15	220	....
" 11.....	16.0	6.8	9.2	15	0.16	0.21	48	32	16	134	72	53	19	236	0.00
" 12.....	12.0	3.4	8.6	16	0.30	0.00	54	40	14	144	65	48	17	224	0.00
" 14.....	4.1	1.7	2.4	14	0.10	0.00	24	18	6	53	42	36	6	164	....
" 15.....	9.6	5.6	4.0	13	0.11	0.00	39	30	9	110	86	55	31	192	....
" 16.....	11.0	6.8	4.2	15	0.08	0.05	49	34	15	130	76	55	21	204	....
" 17.....	12.0	8.6	3.4	14	0.09	0.12	51	30	21	130	80	59	21	208	0.13
" 18.....	11.0	6.8	4.2	15	0.06	0.00	48	34	14	124	60	50	10	228	0.00
" 19.....	13.0	7.8	5.2	14	0.00	0.06	49	35	14	118	70	50	20	240	0.00
" 21.....	4.9	3.3	1.6	14	0.00	0.03	26	18	8	62	43	35	8	170	0.00
" 22.....	11.0	6.6	4.4	16	0.01	0.06	46	39	7	112	70	51	19	216	0.00
" 23.....	12.0	7.6	4.4	15	0.00	0.00	46	30	16	120	63	45	18	236	0.00
" 24.....	8.0	4.0	4.0	16	0.01	0.23	43	32	11	128	74	66	8	204	0.00
" 25.....	12.0	4.2	7.8	16	0.06	0.05	50	32	18	138	83	65	18	244	0.00
" 26.....	11.0	4.8	6.2	17	0.02	0.24	50	33	17	138	75	56	19	212	....
" 28.....	10.0	4.3	5.7	15	0.00	0.29	27	18	9	70	53	46	7	172	....
" 29.....	9.8	6.6	3.2	16	0.08	....	48	34	14	110	84	58	26	216	0.00
Average....	10.0	5.7	4.3	14	0.09	0.13	39	27	12	105	67	51	16	208	0.10

Date 1908	Parts per Million														
	Nitrogen						Oxygen Consumed			Chlorine	Suspended Matter			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
	Organic			Free Ammonia	Nitrites	Nitrates									
	Total	Dissolved	Suspended				Total	Dissolved	Suspended		Total	Volatile	Fixed		
July 1.....	12.0	7.0	5.0	17.0	0.00	0.11	54	35	19	148	95	68	27	228	0.13
" 2.....	18.0	10.0	8.0	13.0	0.00	0.00	58	38	20	172	106	75	31	232	....
" 4.....	7.6	4.3	3.3	15.0	0.00	0.00	38	22	16	92	62	51	11	180	0.00
" 5.....	8.6	5.7	2.9	14.0	0.00	0.00	46	16	30	67	46	40	6	164	1.10
" 6.....	13.0	6.2	6.8	14.0	0.00	0.11	48	32	16	118	86	67	19	224	0.19
" 7.....	11.0	5.8	5.2	16.0	0.00	0.00	54	36	18	160	83	58	25	224	....
" 8.....	12.0	5.8	6.2	16.0	0.01	0.27	57	38	19	170	88	64	24	220	0.00
" 9.....	11.0	5.6	5.4	17.0	0.04	0.15	56	37	19	174	94	75	19	220	0.00
" 10.....	11.0	6.6	4.4	16.0	0.02	0.09	57	42	15	172	74	54	20	232	0.00
" 12.....	7.4	2.4	5.0	16.0	0.00	0.00	53	19	34	70	53	43	10	184	0.00
" 13.....	11.0	7.6	3.4	15.0	0.01	0.00	52	30	22	120	89	72	17	228	0.07
" 14.....	11.0	5.8	5.2	16.0	0.00	0.14	57	37	20	154	92	64	28	224	0.00
" 15.....	12.0	7.0	5.0	15.0	0.02	0.20	60	39	21	128	73	50	23	224	0.00
" 16.....	11.0	7.4	3.6	16.0	0.02	0.32	55	36	19	134	88	63	25	225	1.20
" 18.....	10.0	7.8	2.2	14.0	0.00	0.22	52	34	18	114	144	66	78	208	..0.
" 19.....	8.8	5.5	3.3	13.0	0.00	0.08	30	20	10	60	55	34	21	184	..0.
" 20.....	9.2	6.8	2.4	15.0	0.01	0.11	82	33	49	128	80	61	19	216	0.13
" 21.....	12.0	6.8	5.2	15.0	0.02	0.20	53	36	17	162	72	56	16	224	0.07
" 22.....	11.0	5.8	5.2	16.0	0.00	0.16	55	36	19	168	83	71	12	228	0.07
" 23.....	11.0	6.8	4.2	15.0	0.00	0.22	57	39	18	168	84	63	21	228	0.24
" 24.....	12.0	8.4	3.6	15.0	0.00	0.19	97	36	61	162	83	58	25	236	0.00
" 26.....	8.0	5.6	2.4	13.0	0.13	0.00	30	16	14	74	52	44	8	174	0.00
" 27.....	....	...	....	12.0	0.00	0.00	44	26	18	126	86	62	24	224	0.31
" 28.....	12.0	6.8	5.2	15.0	0.00	0.11	54	34	20	194	86	57	29	224	0.00
" 29.....	22.0	7.2	14.8	13.0	0.00	0.29	55	35	20	170	194	122	72	224	0.00
" 30.....	8.8	4.8	4.0	17.0	0.00	0.57	54	36	18	156	104	86	18	228	0.07
" 31.....	13.0	7.4	5.6	16.0	0.01	0.15	53	34	19	154	113	78	35	244	0.00
Average....	11.3	6.4	4.9	15.0	0.01	0.14	54	32	22	137	87	63	24	217	0.15

Date 1908	Parts per Million: Nitrogen, Organic, Total	Nitrogen, Organic, Dissolved	Nitrogen, Organic, Suspended	Nitrogen, Free Ammonia	Nitrogen, Nitrites	Nitrogen, Nitrates	Oxygen Consumed, Total	Oxygen Consumed, Dissolved	Oxygen Consumed, Suspended	Chlorine	Suspended Matter, Total	Suspended Matter, Volatile	Suspended Matter, Fixed	Alkalinity in Terms of Ca Co 3
Aug. 1.....	11.0	6.0	5.0	15	0.02	0.11	51	33	18	130	115	81	34	212
" 3.....	14.0	9.0	5.0	16	0.00	0.00	49	32	17	128	104	76	28	224
" 4.....	12.0	6.0	6.0	19	0.00	0.00	59	36	23	142	113	79	34	252
" 5.....	12.0	5.8	6.2	24	0.00	0.11	63	40	23	152	113	73	40	288
" 8.....	7.0	2.7	4.3	26	0.00	0.14	55	35	20	132	115	71	44	238
" 9.....	5.4	3.3	2.1	22	0.00	0.06	36	21	15	81	78	...	...	204
" 11.....	13.0	7.2	5.8	17	0.00	0.11	62	37	25	144	128	88	40	236
" 12.....	14.0	10.0	4.0	13	0.00	0.03	53	31	22	144	120	88	32	208
" 13.....	11.0	8.2	2.8	16	0.00	0.19	55	30	25	138	119	83	36	228
" 14.....	12.0	7.2	4.8	17	0.00	0.16	56	33	23	156	127	91	36	232
" 15.....	12.0	7.0	5.0	18	0.00	0.14	50	31	19	120	129	87	42	228
" 16.....	7.8	4.6	3.2	18	0.00	0.11	34	25	9	71	91	65	26	200
" 17....	12.0	8.4	3.6	15	0.00	0.03	58	32	26	126	212	90	122	220
" 19.....	12.0	5.4	6.6	14	0.00	0.18	51	32	19	146	110	70	40	224
" 20.....	7.4	4.2	3.2	16	0.00	0.22	53	36	17	136	115	76	39	226
" 21.....	9.0	5.0	4.0	16	0.02	0.06	53	35	18	140	119	82	37	244
" 22.....	8.4	5.1	3.3	15	0.00	0.03	42	25	17	100	76	54	22	196
" 23.....	5.4	1.7	3.7	14	0.01	0.01	30	20	10	56	65	48	17	182
" 24.....	13.0	7.6	5.4	15	0.00	0.11	53	32	21	112	100	73	27	264
" 25.....	14.0	8.2	5.8	16	0.00	0.00	67	36	31	132	220	132	88	308
" 26.....	12.0	6.8	5.2	15	0.01	0.01	64	29	35	120	163	98	65	244
" 27.....	15.0	7.8	7.2	14	0.04	0.23	60	32	28	146	142	96	46	248
" 28.....	12.0	8.6	3.4	14	0.03	0.29	50	..	..	118	76	57	19	196
" 29.....	11.0	4.1	6.9	14	0.12	0.00	52	27	25	98	84	63	21	240
" 30.....	6.2	3.2	3.0	14	0.24	0.03	36	24	12	50	67	49	18	200
" 31.....	15.0	9.2	5.8	15	0.20	0.07	62	45	17	100	105	81	24	224
Average....	10.9	6.2	4.7	16	.026	60.09	52	32	21	119	115	78	39	229

	Parts per Million									
Date 1908	Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter.			Alkalinity in Terms of Ca Co 3
	Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed	
Sept. 1.....	11.0	16	0.24	0.18	62	122	103	80	23	256
" 2.....	11.0	16	0.16	0.26	62	132	86	61	25	240
" 3.....	11.0	15	0.12	0.15	62	122	93	70	23	252
" 4.....	9.8	15	0.14	0.18	56	138	88	66	22	244
" 5.....	10.0	14	0.08	0.29	55	104	103	70	33	232
" 6.....	6.0	14	0.12	0.15	33	48	82	60	22	172
" 7.....	7.8	15	0.02	0.05	38	47	73	59	14	198
" 8.....	14.0	16	0.10	0.02	65	104	106	78	28	284
" 9.....	12.0	17	0.18	0.06	65	136	87	65	22	248
" 10.....	10.0	16	0.30	0.02	76	126	145	105	40	256
" 11.....	13.0	17	0.06	0.16	86	142	140	98	42	252
" 12.....	11.0	16	0.04	0.13	69	138	101	72	29	216
" 13.....	8.0	16	0.08	0.04	55	60	77	59	18	144
" 14.....	14.0	17	0.10	0.17	66	120	112	88	24	248
" 15.....	12.0	17	0.11	0.00	64	148	98	67	31	264
" 16.....	10.0	18	0.09	0.00	68	168	106	75	31	296
" 17.....	14.0	16	0.07	0.00	85	152	84	60	24	276
" 18.....	14.0	16	0.12	0.14	78	144	113	80	33	288
" 19.....	12.0	18	0.07	0.04	68	146	118	78	40	224
" 21.....	16.0	17	0.12	0.07	77	130	131	99	32	260
" 22.....	13.0	18	0.12	0.02	81	146	132	92	40	288
" 23.....	12.0	17	0.11	0.03	78	152	110	79	31	264
" 24.....	15.0	15	0.20	0.00	82	150	102	74	28	308
" 25.....	14.0	17	0.18	0.01	87	132	156	106	50	252
" 26.....	12.0	17	0.10	0.00	80	120	118	85	33	244
" 27.....	6.9	16	0.08	0.03	36	58	86	61	25	214
" 28.....	11.0	17	0.22	0.00	66	128	137	82	55	232
" 29.....	14.0	16	0.30	0.14	80	130	148	93	55	264
" 30.....	12.0	16	0.12	0.04	74	132	182	118	64	240
Average....	11.6	16	0.13	0.08	67	123	111	79	32	247

Date 1908	Parts per Million											
	Temp. Deg. F.	Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter.			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
Oct. 1.....	57	13.0	14	0.08	0.00	82	128	125	81	44	244	0.00
" 2.....	54	11.0	14	0.32	0.00	74	136	106	70	36	228	0.00
" 4.....	56	12.0	13	0.70	0.24	47	53	156	102	54	206	0.00
" 5.....	57	15.0	15	0.08	0.21	80	118	172	118	54	252	0.00
" 6.....	57	13.0	14	0.90	0.20	61	124	130	86	44	256	0.00
" 7.....	58	14.0	16	0.80	0.16	71	130	112	76	36	228	0.00
" 8.....	58	14.0	14	0.90	0.15	69	136	126	86	40	268	0.00
" 9.....	58	12.0	16	0.40	0.02	68	122	102	70	32	228	0.00
" 10.....	57	16.0	14	0.22	0.12	70	110	118	80	38	240	0.00
" 11.....	56	8.5	14	0.04	0.22	45	46	126	62	64	162	0.00
" 13.....	56	16.0	14	0.07	0.30	84	128	232	142	90	244	0.00
" 14.....	56	17.0	14	0.18	0.01	75	130	160	94	66	240	0.00
" 15.....	57	14.0	13	0.07	0.17	67	120	99	69	30	244	0.00
" 16.....	57	15.0	14	0.07	0.22	74	130	144	90	54	244	0.00
" 17.....	57	13.0	16	0.10	0.14	71	126	152	100	52	260	0.00
" 18.....	57	8.1	17	0.07	0.12	55	53	118	78	40	238	0.00
" 19.....	57	15.0	16	0.11	0.20	78	140	142	98	44	252	0.00
" 20.....	55	15.0	17	0.12	0.14	78	168	63	47	16	252	0.00
" 21.....	55	12.0	16	0.20	0.20	72	186	126	78	48	244	0.00
" 22.....	55	14.0	18	0.10	0.27	87	156	296	186	110	240	0.00
" 23.....	55	19.0	15	0.12	0.02	88	162	228	140	88	264	....
" 24.....	57	14.0	17	0.14	0.12	90	140	240	158	82	240	0.00
" 25.....	57	5.1	16	0.01	0.15	51	70	90	66	24	228	0.00
" 26.....	57	11.0	15	0.12	0.28	75	106	136	90	46	244	0.00
" 27.....	57	9.7	16	0.12	0.10	69	138	118	82	36	272	0.00
" 28.....	56	12.0	13	0.10	0.30	69	122	130	84	46	240	0.00
" 29.....	56	11.0	14	0.14	0.15	66	138	96	68	28	260	0.00
" 30.....	54	12.0	17	0.08	0.29	78	146	196	130	66	260	0.00
" 31.....	53	11.0	16	0.08	0.21	66	124	112	98	14	248	0.00
Average....	56	13.0	15	0.22	0.16	71	124	143	94	49	242	0.00

Date 1908	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
						Parts per Million						
Nov. 1.....	51	8.3	16	0.08	0.18	50	53	112	76	36	228	0.00
" 2.....	51	13.0	15	0.08	0.29	74	116	156	86	70	260	0.00
" 3.....	52	9.9	16	0.07	0.33	59	118	144	104	40	240	0.00
" 4.....	52	17.0	14	0.70	0.40	67	142	112	76	36	272	0.20
" 5.....	52	18.0	18	0.70	0.23	80	166	130	86	44	244	0.00
" 6.....	52	16.0	13	0.50	0.43	72	174	120	80	40	252	0.00
" 7.....	52	17.0	13	0.50	0.43	64	146	98	72	26	240	0.53
" 8.....	51	8.8	15	0.10	0.16	43	71	98	76	22	206	1.70
" 9.....	51	14.0	15	0.60	0.27	67	154	90	68	22	272	0.67
" 10.....	52	14.0	15	0.50	0.12	68	170	112	82	30	268	1.60
" 11.....	52	14.0	15	0.55	0.38	66	142	134	92	42	228	0.86
" 12.....	51	15.0	16	0.45	0.37	71	140	122	90	32	272	1.20
" 13.....	52	12.0	22	0.20	0.47	66	136	108	82	26	272	0.76
" 14.....	52	15.0	16	0.10	0.37	72	144	108	80	28	256	0.26
" 15.....	50	9.7	15	0.04	0.20	48	52	104	84	20	218	0.00
" 16.....	50	18.0	12	0.25	1.00	70	136	114	92	22	276	0.80
" 17.....	50	15.0	14	0.40	0.60	72	162	118	92	26	216	2.30
" 18.....	50	15.0	15	0.30	0.37	68	142	140	88	52	260	1.10
" 19.....	50	14.0	15	0.40	0.37	73	134	152	98	54	260	1.10
" 20.....	51	13.0	16	0.50	0.32	69	154	110	68	42	240	0.46
" 21.....	50	16.0	15	0.35	0.32	58	128	92	92	00	236	0.33
" 23.....	52	13.0	15	0.05	0.47	66	128	138	104	34	508	1.10
" 24.....	51	15.0	17	0.08	0.29	73	156	130	94	36	556	0.99
" 26.....	51	10.0	15	0.20	0.17	41	89	131	97	34	508	0.60
" 27.....	51	15.0	18	0.35	0.52	76	186	144	112	32	536	0.18
" 28.....	51	15.0	17	0.24	0.58	73	166	110	62	48	424	0.60
" 29.....	50	7.4	17	0.18	0.82	41	65	102	66	36	416	0.59
" 30.....	50	18.0	14	0.35	1.10	79	184	190	100	90	396	1.90
Average....	51	14.0	15.5	0.32	0.41	65	134	122	86	36	306	0.71

Date 1908	Parts per Million											
	Temp. Deg. F.	Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter.			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
Dec. 1.....	50	18.0	14.0	0.30	1.30	72	166	140	98	42	238	3.2
" 2.....	50	18.0	13.0	0.55	0.55	71	180	146	100	46	202	2.8
" 7.....	48	14.0	8.7	0.20	1.30	46	136	62	53	9	172	6.0
" 8.....	48	15.0	9.4	0.25	1.55	58	164	53	42	11	186	4.5
" 9.....	48	14.0	11.0	1.00	0.40	59	186	61	47	14	194	3.2
" 10.....	48	13.0	12.0	0.40	0.60	58	178	79	61	18	200	5.3
" 11.....	48	9.8	13.0	0.70	0.10	58	178	69	56	13	172	3.1
" 12.....	48	12.0	12.0	0.35	2.55	59	190	59	43	16	222	2.7
" 13.....	47	7.4	13.0	0.60	0.50	34	64	56	47	9	164	4.8
" 14.....	47	10.0	14.0	0.40	0.40	57	140	68	54	14	190	1.0
" 15.....	48	12.0	14.0	0.40	0.30	54	148	88	70	18	180	2.0
" 16.....	48	17.0	14.0	0.70	0.50	55	174	79	61	18	208	2.0
" 17.....	48	12.0	16.0	0.40	....	52	158	70	54	16	220	1.1
" 18.....	48	13.0	16.0	0.20	....	53	160	...	...	..	238	1.4
" 19.....	48	16.0	16.0	0.20	....	51	150	94	69	25	222	1.7
" 20.....	47	10.0	15.0	0.10	0.30	32	163	58	52	6	164	5.9
" 21.....	47	12.0	16.0	0.10	0.60	56	172	76	67	9	208	1.7
22.....	48	14.0	14.0	0.40	0.30	56	184	63	51	12	208	3.1
" 23.....	47	11.0	13.0	0.25	0.65	53	186	78	64	14	210	3.2
" 25.....	46	11.0	16.0	0.45	0.05	38	82	44	38	6	180	...
" 26.....	47	14.0	15.0	0.50	0.40	47	104	64	58	6	176	1.9
" 27.....	46	12.0	17.0	0.10	0.40	32	57	68	65	3	172	5.4
" 28.....	47	14.0	15.0	0.45	0.35	58	154	68	65	3	244	1.3
" 29.....	48	16.0	13.0	1.60	0.00	69	120	86	80	6	204	2.5
" 30.....	47	16.0	14.0	0.30	0.40	63	158	82	70	12	208	3.7
" 31.....	47	19.0	13.0	0.25	1.45	67	166	83	67	16	212	2.2
Average....	48	13.5	13.7	0.43	0.65	54	151	76	61	15	200	3.0

Date 1909	Temp. Deg. F.	Parts per Million										
		Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter			Alkalinity in Terms of Ca. Co. 3	Oxygen Dissolved
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
Jan. 2.....	47	15.0	17.0	1.30	0.00	53	122	74	66	8	208	3.6
" 3.....	45	10.0	17.0	0.45	0.53	34	54	71	69	2	168	6.3
" 4.....	46	17.0	11.0	0.45	0.55	56	136	65	59	6	204	4.0
" 5.....	47	15.0	8.0	0.20	1.60	63	140	76	58	18	184	5.1
" 6.....	46	16.0	9.0	0.20	2.40	60	142	73	59	14	200	1.7
" 7.....	45	13.0	9.4	0.25	1.50	60	138	67	50	17	188	3.7
" 8.....	45	15.0	11.0	0.30	1.20	61	148	87	73	14	196	6.2
" 9.....	46	22.0	12.0	0.20	1.20	71	168	95	79	16	204	0.6
" 10.....	46	8.8	16.0	0.45	0.85	46	63	61	52	9	192	5.6
" 11.....	46	14.0	14.0	0.80	0.18	73	190	93	72	21	236	2.7
" 12.....	46	16.0	14.0	0.90	0.02	65	194	64	48	16	232	2.9
" 13.....	47	14.0	13.0	0.70	0.70	69	190	89	64	25	216	2.5
" 14.....	48	16.0	12.0	0.40	0.80	75	184	96	80	16	200	2.6
" 15.....	47	23.0	12.0	0.40	1.10	78	252	89	73	16	232	2.1
" 16.....	47	18.0	18.0	0.40	0.02	83	244	112	86	26	256	0.0
" 17.....	45	13.0	13.0	0.20	1.20	62	72	64	56	8	212	6.0
" 18.....	46	14.0	16.0	0.35	1.00	74	242	106	78	28	204	0.0
" 19.....	46	21.0	10.0	0.15	1.00	68	182	87	66	21	200	1.8
" 20.....	47	24.0	10.0	0.25	1.10	77	212	113	85	28	212	3.0
" 21.....	47	20.0	10.0	0.30	1.00	79	226	103	77	26	232	1.2
" 22.....	48	23.0	12.0	0.35	1.00	79	248	143	86	57	224	0.0
" 23.....	47	22.0	10.0	0.20	1.20	80	210	146	78	68	196	3.1
" 24.....	46	10.0	9.0	0.30	1.20	40	52	64	47	17	160	4.6
" 25.....	45	16.0	9.7	0.25	2.00	75	178	81	63	18	200	3.6
" 26.....	46	17.0	8.7	0.30	1.70	75	190	80	54	26	208	2.8
" 27.....	47	18.0	8.0	0.30	1.50	78	174	76	50	26	204	2.9
" 30.....	46	13.0	17.0	0.70	0.00	72	188	101	76	25	240	2.9
" 31.....	45	14.0	11.0	0.45	1.00	36	54	66	55	11	168	6.8
Average....	46	16.3	12.0	0.41	0.98	66	165	87	66	21	206	3.2

Date 1909	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
					Parts per Million							
Feb. 1.....	46	20.0	11.0	0.70	0.70	74	180	93	67	26	252	1.20
" 2.....	46	15.0	11.0	1.00	0.20	72	204	90	79	11	224	1.70
" 4.....	46	19.0	13.0	0.55	0.85	75	234	99	80	19	232	1.40
" 5.....	46	18.0	9.0	0.20	1.10	78	244	106	72	34	212	0.55
" 6.....	46	14.0	12.0	0.90	0.70	69	204	97	74	23	208	3.30
" 7.....	44	15.0	12.0	0.20	1.70	34	68	65	58	7	172	5.50
" 8.....	46	18.0	10.0	0.30	2.00	80	200	102	77	25	200	0.52
" 9.....	46	21.0	10.0	0.65	1.4	76	226	87	70	17	212	2.50
" 10.....	46	20.0	10.0	0.90	0.60	71	228	127	75	52	204	2.10
" 11.....	46	20.0	10.0	0.25	1.7	76	202	104	74	30	196	2.40
" 12.....	46	19.0	11.0	0.25	1.2	74	236	100	88	12	212	2.80
" 13.....	46	19.0	10.0	0.30	1.40	78	204	92	84	8	228	2.00
" 14.....	45	15.0	11.0	0.20	1.80	46	64	66	54	12	172	6.80*
" 15.....	45	18.0	9.0	0.20	1.40	74	166	114	84	30	232	2.70
" 16.....	45	14.0	8.4	0.20	2.30	61	118	80	52	28	188	4.70
" 17.....	45	16.0	10.0	0.20	1.70	69	166	52	46	6	196	3.70
" 18.....	46	17.0	11.0	0.20	1.60	62	196	82	60	22	200	2.80
" 19.....	46	16.0	9.0	0.20	1.70	61	144	82	64	18	176	4.30
" 21.....	41	6.8	6.0	0.15	2.4	26	44	70	62	8	148	8.20
" 22.....	43	17.0	8.3	0.25	3.2	60	110	80	58	22	184	3.70
" 28.....	44	11.0	8.7	0.40	3.1	50	74	56	48	8	184	6.40
Average....	45	16.5	10.0	0.39	1.56	65	167	88	68	20	202	3.30

Date 1909	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
Mch. 2.....	44	16.0	8.7	0.20	1.40	66	126	84	66	18	196	3.6
" 4.....	45	17.0	11.0	1.10	0.90	60	182	98	88	10	200	3.6
" 6.....	44	16.0	14.0	0.25	1.45	64	194	88	66	22	224	4.1
" 8.....	44	15.0	11.0	0.35	1.75	60	138	86	64	22	200	5.3
" 10.....	45	22.0	11.0	0.90	1.20	63	166	86	64	22	192	3.5
" 12.....	45	18.0	10.0	0.30	1.30	61	150	96	74	22	196	3.8
" 14.....	44	12.0	12.0	0.25	1.95	50	90	82	50	32	180	5.4
" 16.....	44	16.0	10.0	0.90	1.30	57	140	104	90	14	184	3.6
" 18.....	45	17.0	10.0	0.35	1.75	58	164	98	64	34	192	3.9
" 20.....	45	15.0	11.0	0.25	1.95	55	122	94	74	20	196	4.3
" 22.....	44	13.0	12.0	0.20	1.90	52	98	80	56	24	184	5.4
" 24.....	42	13.0	9.0	0.20	2.30	52	96	80	58	22	188	3.7
" 26.....	43	9.2	12.0	0.80	1.80	48	108	74	62	12	220	4.6
" 28.....	43	12.0	9.0	0.40	2.20	38	72	64	42	22	208	4.1
" 30.....	43	15.0	8.4	0.90	2.60	58	106	126	78	48	200	4.6
Average....	44	15.0	10.6	0.49	1.7	56	130	89	66	23	197	4.2

Note—Each sample covers 48 hours.

Date 1909	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
Apr. 1.....	43	15.0	7.0	0.25	2.60	45	92	86	58	28	196	4.0
" 3.....	43	8.0	10.0	1.10	0.20	47	88	78	60	18	200	3.1
" 5.....	43	9.2	8.0	0.50	2.30	43	60	72	56	16	160	6.2
" 9.....	44	9.0	9.0	1.80	0.60	56	118	76	54	22	216	4.1
" 11.....	44	10.0	9.7	1.30	1.10	40	72	72	64	8	192	6.0
" 13.....	45	14.0	10.0	0.40	1.60	55	130	96	72	24	212	3.1
" 15.....	47	12.0	6.4	1.60	1.10	41	102	74	56	18	172	4.7
" 17.....	46	9.4	14.0	2.40	0.00	44	138	72	58	14	212	4.1
" 19.....	45	15.0	10.0	0.20	2.90	47	96	74	60	14	188	2.9
" 21.....	47	20.0	10.0	0.80	2.00	58	128	108	62	46	204	2.9
" 23.....	47	17.0	11.0	0.45	2.15	58	136	138	52	86	200	3.2
" 25.....	46	12.0	9.7	0.30	2.10	48	88	74	56	18	228	7.3
" 27.....	48	19.0	11.0	0.25	2.40	59	180	106	74	32	216	4.3
" 29.....	47	19.0	11.0	0.35	2.05	57	208	80	58	22	216	4.7
Average....	45	13.5	9.7	0.84	1.6	50	117	86	60	26	200	4.3

Note—Each sample covers 48 hours.

Date 1909	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
May 1.....	46	11	11.0	1.70	0.7	47	150	104	60	44	208	4.2
" 3.....	47	12	10.0	0.50	0.9	40	100	88	66	22	200	3.1
" 5.....	49	20	9.4	0.40	1.8	56	160	84	60	24	212	1.7
" 7.....	50	22	11.0	1.20	0.8	57	170	116	70	46	200	3.8
" 9.....	52	15	11.0	0.80	1.4	40	108	86	74	12	208	3.3
" 11.....	52	16	10.0	0.30	2.0	57	148	124	58	66	196	2.4
" 13.....	52	20	10.0	0.25	2.3	59	186	118	74	44	200	2.5
" 15.....	53	23	12.0	2.00	0.1	59	194	122	88	34	240	3.2
" 17.....	52	15	11.0	0.60	2.0	57	106	92	54	38	217	2.5
" 19.....	52	21	11.0	0.40	2.2	62	210	108	76	32	220	2.3
" 21.....	53	22	9.0	1.40	0.4	71	196	164	96	68	220	1.9
" 23.....	52	17	13.0	0.40	0.2	45	120	98	82	16	220	3.0
25.....	54	20	13.0	0.30	1.6	62	192	112	80	32	232	0.6
" 27.....	55	19	12.0	0.35	1.3	64	188	140	92	48	240	0.63
" 28.....	56	20	11.0	0.35	1.4	59	186	120	70	50	212	2.1
Average....	52	18	11.3	0.73	1.3	55	161	112	73	39	215	2.5

Note—Each sample covers 48 hours.

Date 1909	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
June 1.....	55	23	14	0.50	0.80	65	202	140	110	30	240	1.7
" 3.....	57	24	15	0.45	0.95	64	224	122	90	32	232	1.1
" 5.....	56	19	18	0.00	0.40	64	204	166	104	62	256	0.9
" 7.....	57	15	14	0.35	0.55	51	142	82	62	20	212	0.7
" 9.....	56	21	17	0.35	0.45	66	240	132	100	32	232	0.4
" 11.....	57	22	12	0.60	0.70	64	198	134	80	54	228	0.4
" 13.....	58	12	16	0.05	0.15	44	114	104	70	34	212	1.5
" 15.....	57	15	16	0.80	0.00	54	184	92	62	30	224	1.3
" 17.....	57	13	18	0.20	0.30	54	214	82	62	20	224	1.4
" 19.....	56	15	18	0.00	0.20	56	178	92	70	22	248	0.6
" 22.....	59	16	17	0.10	0.20	58	184	104	78	26	248	0.0
" 24.....	62	17	19	0.05	0.45	58	220	94	78	16	232	0.0
" 26.....	62	15	18	0.03	0.78	55	236	94	78	16	268	0.0
" 28.....	61	12	16	0.04	0.56	39	98	48	46	2	208	0.0
" 30.....	62	13	23	0.02	0.25	58	264	116	96	20	248	0.0
Average....	58	17	17	0.24	0.45	57	193	107	79	28	234	0.7

Note—Each sample covers 48 hours.

Appendix G.

Data Relating to the Character of Sludge of the Several Compartments of the Septic and Settling Tanks.

Weight of Sludge per Cu. Yard (Pounds).

Date	Sections of Tank.				Weighted Average of Sections.
	1	2	3	4	
Aug. 8, 1908.	1752	1720	1720	1720	1728
Aug. 26, ” .	1735	1720	1720	1720	1721
Sept. 11, ” .	1786	1720	1720	1720	1730
Nov. 9, ” .	1752	1735	1735	1735	1740
Dec. 3, ” .	1752	1735	1735	1720	1735
Jan. 9, 1909.	1752	1786	1752	....	1764
Feb. 2, ” .	1770	1770	1752	1752	1766
Mar. 2, ” .	1854	1786	1786	1786	1821
Apr. 3, ” .	1820	1820	1810	1810	1818
May 5, ” .	1837	1837	1810	1810	1826
Sept. 3, ” .	1911	1921	1820	1820	1898
Average.....	1794	1777	1760	1769	1777

Specific Gravity.

Date	1	2	3	4	Weighted Average of Sections.
Aug. 8, 1908.	1.04	1.02	1.02	1.02	1.03
Aug. 26, ” .	1.03	1.02	1.02	1.02	1.02
Sept. 11, ” .	1.06	1.02	1.02	1.02	1.03
Nov. 9, ” .	1.04	1.03	1.03	1.03	1.03
Dec. 3, ” .	1.04	1.03	1.03	1.02	1.03
Jan. 9, 1909.	1.04	1.06	1.04	....	1.05
Feb. 2, ”	1.05	1.05	1.04	1.04	1.05
Mar. 2, ” .	1.10	1.06	1.06	1.06	1.08
Apr. 3, ” .	1.08	1.08	1.07	1.07	1.08
May 5, ” .	1.09	1.09	1.07	1.07	1.08
June 3, ” .	1.14	1.14	1.08	1.08	1.13
Average.....	1.06	1.05	1.04	1.04	1.05

Water (Per Cent.)

Date	1	2	3	4	Weighted Average of Sections.
Aug. 8, 1908.	91	94	94	96	94
Aug. 26, ” .	92	92	94	94	93
Sept. 11, ” .	89	94	94	94	93
Nov. 9, ” .	89	93	94	93	92
Dec. 3, ” .	91	91	92	92	92
Jan. 9, 1909.	90	92	93	..	92
Feb. 2, ” .	89	91	93	93	92
Mar. 2, ” .	81	89	89	91	88
Apr. 3, ” .	87	87	89	89	88
May 5, ” .	84	84	88	88	86
June 3, ” .	78	78	86	86	82
Average....	87.4	89.5	91.5	91.6	90.0

Volatile Matter (Per Cent.)

Aug. 8, 1908.	50	79	79	67	69
Aug. 26, " .	55	54	50	50	52
Sept. 11, " .	63	55	50	50	55
Nov. 9, " .	63	50	51	50	54
Dec. 3, " .	52	53	53	54	53
Jan. 9, 1909.	57	55	52	..	55
Feb. 2, " .	59	55	54	55	56
Mar. 2, " .	48	54	48	49	50
Apr. 3, " .	51	51	48	48	50
May 5, " .	53	53	45	45	49
June 3, " .	33	33	40	40	36
Average....	53.1	53.8	51.8	50.8	52.6

Nitrogen (Per Cent.)

Aug. 8, 1908.	2.1	4.4	4.4	2.4	3.3
Aug. 26, " .	3.0	2.2	2.3	2.9	2.6
Sept. 11, " .	2.1	2.3	2.3	2.8	2.4
Nov. 9, " .	2.9	2.4	2.8	2.5	2.7
Dec. 3, " .	2.3	2.5	2.2	2.2	2.3
Jan. 9, 1909.	2.5	2.7	2.6	...	2.6
Feb. 2, " .	2.3	2.4	2.3	2.7	2.4
Mar. 2, " .	2.0	2.5	2.5	2.5	2.4
Apr. 3, " .	1.9	1.9	2.2	2.2	2.1
May 5, " .	2.0	2.0	2.2	2.2	2.1
June 3, " .	1.4	1.4	2.4	2.4	1.9
Average....	2.23	2.43	2.56	2.48	2.42

Fats (Per Cent.)

Aug. 8, 1908.	5.6	9.2	9.2	9.5	8.4
Aug. 26, " .	6.0	5.6	6.4	7.3	6.3
Sept. 11, " .	3.8	6.3	6.6	7.0	5.9
Nov. 9, " .	5.1	5.2	5.2	5.2	5.2
Dec. 3, " .	5.9	4.9	5.1	4.4	5.1
Jan. 9, 1909.	4.9	4.3	5.4	...	4.9
Feb. 2, " .	4.7	3.8	4.4	7.3	5.1
Mar. 2, " .	2.2	3.6	3.4	3.5	3.2
Apr. 3, " .	5.7	5.7	3.8	3.8	4.7
May 5, " .	5.4	5.4	4.4	4.4	3.9
June 3, " .	2.5	2.5	4.4	4.4	3.4
Average....	4.71	5.15	5.30	5.68	5.19

Weight of Sludge per Cu. Yard (Pounds).

Date	Sections of Tank. 1	2	3	4	Weighted Average of Sections.
Aug. 8, 1908.	1735	1735	1735	1735	1735
Sept. 3, " .	1820	1735	1720	1720	1780
Oct. 8, " .	1752	1720	1702	1702	1724
Nov. 21, " .	1810	1752	1770	1752	1774
Dec. 24, " .	1810	1770	1786	1770	1784
Feb. 2, 1909.	1752	1752	1752	1752	1752
Mar. 2, " .	1810	1786	1786	1786	1792
Apr. 3, " .	1786	1786	1810	1810	1795
May 5, " .	1820	1820	1820	1820	1820
June 3, " .	1820	1820	1786	1786	1810
Average....	1791	1768	1767	1763	1776

Specific Gravity.

Date	1	2	3	4	Weighted Average of Sections.
Aug. 8, 1908.	1.03	1.03	1.03	1.03	1.03
Sept. 3, " .	1.08	1.03	1.02	1.02	1.05
Oct. 8, " .	1.04	1.02	1.01	1.01	1.02
Nov. 21, " .	1.07	1.04	1.05	1.04	1.05
Dec. 24, " .	1.07	1.05	1.06	1.05	1.05
Feb. 2, 1909.	1.04	1.04	1.04	1.04	1.04
Mar. 2, " .	1.07	1.06	1.06	1.06	1.06
Apr. 3, " .	1.06	1.06	1.07	1.07	1.06
May 5, " .	1.08	1.08	1.08	1.08	1.08
June 3, " .	1.08	1.08	1.06	1.06	1.07
Average....	1.06	1.05	1.05	1.05	1.05

Water (Per Cent.)

Date	1	2	3	4	Weighted Average of Sections.
Aug. 8, 1908.	96	96	96	97	96
Sept. 3, " .	90	92	92	94	92
Oct. 8, " .	91	94	95	95	94
Nov. 21, " .	89	93	92	93	92
Dec. 24, " .	87	91	91	90	90
Feb. 2, 1909.	92	93	92	93	93
Mar. 2, " .	85	89	90	89	88
Apr. 3, " .	88	88	89	89	89
May 5, " .	87	87	87	87	87
June 3, " .	86	86	91	91	88
Average....	89	91	92	92	91

Volatile Matter (Per Cent.)

Aug. 8, 1908.	56	60	60	61	60
Sept. 3, " .	58	50	50	55	53
Oct. 8, " .	63	58	58	58	59
Nov. 21, "	71	56	52	56	59
Dec. 24, " .	54	50	46	46	49
Feb. 2, 1909.	58	51	52	57	55
Mar. 2, " .	59	53	51	51	54
Apr. 3, " .	53	53	47	47	50
May 5, " .	45	45	47	47	46
June 3, " .	50	50	58	58	54
Average....	56.7	52.6	52.1	53.6	53.8

Nitrogen (Per Cent.)

Aug. 8, 1908.	2.8	3.0	3.0	3.0	3.0
Sept. 3, " .	2.2	2.3	2.6	2.6	2.4
Oct. 8, " .	2.6	2.6	2.6	2.7	2.6
Nov. 21, " .	2.7	3.8	3.2	3.3	3.3
Dec. 24, " .	2.6	2.1	2.8	2.2	2.4
Feb. 2, 1909.	2.4	2.4	2.5	2.4	2.4
Mar. 2, " .	2.4	2.5	3.1	2.3	2.6
Apr. 3, " .	2.4	2.4	2.3	2.3	2.4
May 5, " .	2.3	2.3	2.2	2.2	2.2
June 3, " .	1.8	1.8	2.7	2.7	2.3
Average....	2.42	2.52	2.70	2.57	2.56

Fats (Per Cent.)

Aug. 8, 1908.	6.5	5.0	5.0	6.0	5.6
Sept. 3, " .	5.3	4.8	4.9	5.2	5.1
Oct. 8, " .	5.8	5.9	4.7	4.9	5.3
Nov. 21, " .	7.8	6.9	6.9	3.6	6.3
Dec. 24, " .	4.4	6.5	5.4	2.0	4.6
Feb. 2, 1909.	5.5	5.9	5.5	4.1	5.3
Mar. 2, " .	4.0	3.6	4.8	3.9	4.1
Apr. 3, " .	3.4	3.4	4.3	4.3	3.8
May 5, " .	4.3	4.3	3.4	3.4	3.8
June 3, " .	4.9	4.9	5.3	5.3	5.1
Average....	5.19	5.12	5.02	4.27	4.90

Appendix H.

Results of Chemical Analyses of Influent and Effluent of Settling Tank.

Analyses of Effluent from Settling Tank.

1908 Date	Parts per Million: Nitrogen. Organic. Total.	Dissolved.	Suspended.	Free Ammonia.	Nitrites.	Nitrates.	Oxygen Consumed. Total.	Dissolved.	Suspended.	Chlorine.	Suspended Matter. Total.	Volatile.	Fixed.	Alkalinity in Terms of Ca Co 3
Aug. 5.....	8.2	...	...	16.0	0.08	0.19	58	39	19	154	79	54	25	220
" 12.....	14.0	9.2	4.8	11.0	0.10	0.12	49	32	17	148	75	61	14	200
" 14.....	11.0	7.8	3.2	14.0	0.02	0.27	50	33	17	156	80	65	15	212
" 15.....	9.6	8.0	1.6	17.0	0.00	0.19	46	30	16	140	61	50	11	252
" 16.....	8.0	5.6	2.4	17.0	0.00	0.08	35	23	12	86	62	49	13	184
" 17.....	11.0	7.8	3.2	14.0	0.04	0.15	46	32	14	124	108	55	53	200
" 19.....	9.0	5.8	3.2	12.0	0.01	0.10	48	30	18	142	80	54	26	196
" 20.....	7.0	4.6	2.4	14.0	0.00	0.00	44	32	12	128	80	63	17	196
" 21.....	9.0	5.8	3.2	12.0	0.14	0.10	50	33	17	128	88	65	23	200
" 22.....	8.2	4.9	3.3	12.0	0.00	0.00	35	24	11	94	48	42	6	176
" 23.....	6.4	2.3	4.1	13.0	0.02	0.02	28	18	10	56	50	43	7	144
" 24.....	12.0	7.0	5.0	14.0	0.00	0.08	49	31	18	112	82	65	17	236
" 25.....	11.0	7.8	3.2	14.0	0.00	0.03	54	33	21	132	76	20	56	272
" 26.....	15.0	6.8	8.2	11.0	0.00	0.00	56	33	23	126	84	61	23	224
" 27.....	10.0	6.0	4.0	15.0	0.14	0.28	48	34	14	140	70	51	19	220
" 28.....	12.0	7.8	4.2	14.0	0.04	0.38	49	..	..	124	73	58	15	184
" 29.....	12.0	3.7	8.3	14.0	0.12	0.05	50	26	24	94	62	51	11	232
" 30.....	5.6	2.2	3.4	13.0	0.12	0.05	32	21	11	52	47	42	5	164
" 31.....	11.0	6.6	4.4	15.0	0.18	0.09	58	36	22	104	94	73	21	208
Average..	10.0	6.1	4.0	14.0	0.05	0.11	47	30	16	118	74	54	20	206

Analyses of Effluent from Settling Tank.

1908 Date	Parts per Million								
	Nitrogen.				Oxygen Consumed	Suspended Matter			Alkalinity in Terms of Ca Co 3
	Organic	Free Ammonia.	Nitrites.	Nitrates.		Total.	Volatile.	Fixed.	
Sept. 1.....	9.0	16.0	0.18	0.24	59	83	66	17	244
" 2.....	8.6	17.0	0.07	0.20	58	80	59	21	288
" 4.....	8.8	12.0	0.15	0.12	50	81	69	12	200
" 5.....	9.4	13.0	0.10	0.27	52	77	63	14	216
" 6.....	3.8	15.0	0.10	0.02	32	64	52	12	156
" 7.....	7.2	14.0	0.01	0.00	37	57	49	8	170
" 8.....	10.0	14.0	0.07	0.01	59	107	84	23	252
" 11.....	13.0	15.0	0.08	0.09	79	98	76	22	228
" 12.....	8.8	16.0	0.04	0.08	60	83	62	21	204
" 13.....	9.2	14.0	0.06	0.01	47	81	65	16	138
" 14.....	11.0	15.0	0.08	0.04	60	104	86	18	220
" 15.....	11.0	15.0	0.08	0.00	57	64	52	12	236
" 16.....	8.4	17.0	0.06	0.00	64	74	54	20	236
" 17.....	13.0	16.0	0.07	0.01	59	80	62	18	236
" 18.....	6.4	16.0	0.03	0.19	71	89	71	18	272
" 19.....	9.4	17.0	0.02	0.06	66	99	69	30	216
" 21.....	13.0	17.0	0.10	0.00	70	83	69	14	236
" 22.....	7.6	15.0	0.09	0.00	67	77	62	15	236
" 23.....	6.8	19.0	0.11	0.00	69	67	54	13	240
" 24.....	13.0	16.0	0.06	0.05	74	68	53	15	276
" 25.....	13.0	16.0	0.04	0.00	74	86	66	20	248
" 26.....	12.0	18.0	0.02	0.00	73	73	61	12	262
" 27.....	8.9	14.0	0.12	0.00	33	52	44	8	202
" 28.....	11.0	17.0	0.02	0.00	59	89	61	28	204
" 29.....	13.0	17.0	0.22	0.00	61	72	55	17	280
" 30.....	9.9	15.0	0.14	0.12	64	70	49	21	165
Average...	9.8	16.0	0.08	0.06	60	79	62	17	225

Analyses of Effluent from Settling Tank.

1908 Date	Temp. Deg. F.	Nitrogen. Organic	Free Ammonia.	Nitrites.	Nitrates.	Oxygen Consumed	Chlorine.	Suspended Matter Total.	Volatile.	Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
						Parts per Million						
Oct. 1.....	57	8.4	15.0	0.18	0.00	69	130	36	24	12	184	0.00
" 2.....	53	12.0	14.0	0.16	0.00	63	132	65	55	10	200	0.00
" 4.....	57	11.0	14.0	0.03	0.09	40	71	56	45	11	200	0,00
" 5.....	57	12.0	14.0	0.12	0.04	63	112	86	67	19	224	0.00
" 6.....	57	12.0	13.0	0.09	0.07	57	122	63	50	13	260	0.00
" 7.....	56	12.0	15.0	0.10	0.07	62	128	66	51	15	240	0.00
" 10.....	58	21.0	9.4	0.28	0.82	59	114	44	44	0	200	0.00
" 11.....	54	8.8	13.0	0.12	0.30	38	45	72	51	21	148	0.00
" 13.....	55	11.0	12.0	0.55	0.25	58	122	69	49	20	220	0.00
" 14.....	56	13.0	14.0	0.10	0.14	60	136	86	57	29	220	0.00
" 15.....	57	13.0	14.0	0.10	0.09	65	130	77	59	18	236	0.00
" 16.....	58	14.0	13.0	0.16	0.15	66	128	79	59	20	216	0.00
" 17.....	58	12.0	14.0	0.28	0.00	61	124	67	52	15	240	0.00
" 18.....	57	8.1	13.0	0.10	0.00	28	55	47	42	5	210	0.00
" 19.....	56	13.0	14.0	0.12	0.14	58	136	58	47	11	212	0.00
" 20.....	53	13.0	15.0	0.12	0.12	64	164	75	63	12	232	0.00
" 21.....	52	14.0	16.0	0.12	0.14	72	170	74	52	22	248	0.00
" 22.....	54	12.0	19.0	0.14	0.28	70	158	86	64	22	232	0.00
" 23.....	55	7.0	15.0	0.12	0.01	61	168	82	64	18	236	....
" 24.....	57	4.5	15.0	0.10	0.12	72	156	75	62	13	228	0.00
" 25.....	57	12.0	13.0	0.02	0.09	37	63	58	50	8	196	0.00
" 26.....	57	9.3	16.0	0.24	0.13	64	110	95	69	26	204	0.00
" 27.....	57	12.0	12.0	0.20	0.00	62	158	59	57	2	240	0.00
" 28....	56	12.0	12.0	0.10	0.32	65	126	89	61	28	260	0.00
" 29.....	56	11.0	12.0	0.20	0.17	60	128	61	48	13	232	0.00
" 30.....	54	12.0	14.0	0.12	0.25	62	140	83	64	19	220	0.00
" 31.....	52	13.0	15.0	0.14	0.15	65	128	112	12	100	220	0.00
Average.	56	11.6	14.0	0.15	0.15	59	124	71	52	19	221	0.00

Analyses of Effluent from Settling Tank.

1908 Date	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine.	Suspended Matter: Total.	Suspended Matter: Volatile.	Suspended Matter: Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
	Parts per Million											
Nov. 1.....	51	6.1	15	0.14	.10	37	53	49	36	13	190	0.00
" 2.....	51	11.0	13	0.08	.21	61	104	64	46	18	256	0.32
" 3.....	52	9.3	15	0.14	.17	47	112	86	66	20	220	0.00
" 4.....	52	14.0	14	0.70	.20	56	134	64	50	14	244	0.00
" 5.....	52	13.0	17	0.70	.75	68	148	70	55	15	216	0.00
" 6.....	52	17.0	11	1.00	.00	66	166	76	54	22	224	0.00
" 7.....	50	13.0	12	0.50	.12	55	122	70	55	15	220	0.71
" 8.....	51	7.2	15	0.12	.14	31	64	55	47	8	176	2.00
" 9.....	51	13.0	16	0.10	.22	60	154	71	53	18	248	0.16
" 10.....	52	13.0	15	0.40	.17	60	170	71	55	16	228	0.24
" 11.....	53	11.0	13	1.20	.10	50	144	54	37	17	232	0.00
" 12.....	52	13.0	16	0.50	.12	63	142	76	57	19	232	0.00
" 13.....	52	14.0	14	0.20	.22	57	144	76	64	12	224	0.00
" 14.....	52	14.0	15	0.15	.22	59	144	90	69	21	224	0.00
" 15.....	50	9.0	16	0.10	.14	33	61	50	48	2	184	0.00
" 16.....	50	13.0	15	0.15	.22	58	130	57	44	13	256	0.00
" 17.....	50	10.0	16	0.24	.58	58	166	80	64	16	252	0.40
" 18.....	51	14.0	14	0.10	.27	59	150	74	56	18	240	0.08
" 19.....	51	13.0	14	0.10	.32	61	138	79	57	22	232	0.00
" 20.....	51	13.0	15	0.15	.27	58	152	77	55	22	236	0.00
" 23.....	51	12.0	14	0.60	.40	60	112	86	72	14	424	1.90
" 24.....	51	14.0	14	0.45	.48	64	148	90	68	22	372	2.90
" 26.....	51	8.6	15	0.60	.17	37	92	70	59	11	376	0.26
" 27.....	51	17.0	15	0.60	.00	67	176	130	98	32	420	0.59
" 28.....	51	15.0	15	0.40	.90	64	162	83	55	28	420	3.00
" 29.....	50	8.8	14	0.16	.51	32	70	58	50	8	352	3.20
" 30.....	50	17.0	14	0.60	.60	68	176	114	67	47	416	0.00
Average..	51	12.0	15	0.38	0.28	55	131	75	57	18	274	0.58

Analyses of Effluent from Settling Tank.

Date 1908	Temp. Deg. F.	Nitrogen. Organic	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Chlorine.	Suspended Matter Total.	Suspended Matter Volatile.	Suspended Matter Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
					Parts per Million							
Dec. 1.....	51	16.0	12	0.35	1 25	71	170	112	74	38	196	4.3
" 2.....	50	14.0	11	0.40	0.90	64	194	67	51	16	202	3.6
" 3	49	16.0	12	0.40	0.60	65	220	88	68	20	202	3.6
" 4.....	49	17.0	11	0.40	0.90	63	232	88	66	22	200	3.2
" 5.....	49	15.0	11	0.30	0.90	60	184	184	67	117	208	2.6
" 7. ...	48	14.0	12	0.45	0.75	56	120	90	75	15	190	2.6
" 8 . ..	48	15.0	11	0.45	1.05	61	165	61	50	11	202	3.5
" 9.....	48	15.0	13	0.70	0.10	62	192	79	61	18	186	5.2
" 10.....	48	14.0	13	0.20	0.40	59	180	81	63	18	214	3.4
" 11...	48	11.0	13	0.80	0.00	58	186	82	64	18	202	2.5
" 12....	48	17.0	12	0.40	2.40	63	196	91	67	24	188	3.2
" 13.....	47	7.6	12	0.70	0.20	33	54	61	53	8	152	4.1
" 14.....	47	11.0	14	0.70	0.30	58	148	78	65	13	202	2.2
" 15.....	49	12.0	13	0.40	0.30	53	150	92	71	21	206	2.3
" 16.....	48	13.0	15	0.30	0.70	54	166	91	70	21	220	1.7
" 17.....	48	16.0	14	0.40	....	55	150	84	60	24	224	1.5
" 18.....	48	12 0	16	0.10	....	54	158	...	..	...	232	2.0
" 19.....	48	17.0	16	0.15	....	52	146	105	84	21	218	1.9
" 20.....	47	10.0	17	0.10	0.40	43	63	76	64	12	162	4.9
" 21.....	47	16.0	15	0.40	0.50	59	166	83	67	16	208	2.3
22.	48	15.0	14	0.60	0.30	57	210	83	67	16	212	2.7
23.....	48	15.0	13	0.20	0.40	59	200	86	69	17	206	1.3
26 .	47	14.0	17	0.55	0.45	52	114	77	75	2	188	1.8
" 28	48	17.0	12	0.40	1.00	61	142	81	70	11	232	2.7
" 30.. ..	47	16.0	13	0.20	0.20	60	156	78	65	13	200	2.0
Average.	48	14.0	13	0.44	0.64	57	162	87	66	21	202	2.8

Analyses of Influent to Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen. Organic.	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Chlorine	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
		Parts per Million										
Jan. 4.....	48	31	14.0	0.20	0.90	98	200	362	226	136	216	5.1
" 5.....	48	26	9.0	0.20	2.50	107	160	354	210	144	204	1.6
" 8.....	46	22	10.0	0.20	1.50	84	146	190	150	40	200	5.2
" 9.....	47	22	11.0	0.20	1.60	96	174	226	152	74	236	3.2
" 12.....	48	24	11.0	0.55	0.65	109	232	318	184	134	220	1.2
" 13.....	48	23	11.0	0.55	0.85	101	186	290	200	90	212	0.1
" 16.....	47	27	13.0	0.10	1.10	108	228	248	170	78	236	1.3
" 17.....	46	14	16.0	0.20	1.30	58	62	122	52	70	188	5.1
" 20.....	47	28	11.0	0.30	0.80	114	214	440	274	170	248	1.9
" 21.....	47	27	11.0	0.20	1.10	106	196	318	222	96	236	0.8
" 24.....	45	13	13.0	0.40	0.70	60	52	168	114	54	168	1.2
" 25.....	46	28	9.7	0.55	1.80	115	188	524	300	224	200	3.8
" 30.....	47	23	13.0	0.20	0.12	119	206	398	278	120	268	1.7
" 31.....	45	11	15.0	0.55	0.65	63	54	154	114	40	172	5.6
Average....	47	23	12.0	0.31	1.11	96	164	294	189	105	215	2.7

Analyses of Effluent from Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Chlorine.	Suspended Matter Total	Suspended Matter Volatile.	Suspended Matter Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
		Parts per Million										
Jan. 4.....	47	15.0	12.0	0.45	0.75	58	126	66	62	4	184	3.2
" 5.....	47	15.0	8.7	0.20	2.10	60	140	68	53	15	184	4.7
" 8.....	45	16.0	9.7	0.25	1.50	60	142	82	66	16	192	2.4
" 9.....	48	18.0	12.0	0.30	1.10	68	160	103	88	15	212	2.4
" 12.....	47	17.0	11.0	0.25	1.10	61	194	70	54	16	216	2.8
" 13.....	47	18.0	11.0	0.20	1.40	70	192	86	62	24	216	2.4
" 16.....	47	22.0	14.0	0.90	0.00	84	254	97	79	18	252	2.8
" 17.....	45	14.0	13.0	0.20	1.10	51	104	71	58	13	196	4.5
" 20.....	47	20.0	10.0	0.20	0.67	79	222	90	73	17	208	3.8
" 21.....	47	22.0	10.0	0.25	1.10	80	222	85	66	19	232	2.2
" 24.....	45	11.0	10.0	0.30	1.10	43	62	65	50	15	160	5.8
" 25.....	45	16.0	9.7	0.30	2.00	72	176	78	61	17	192	4.8
" 30.....	46	14.0	14.0	1.20	0.00	72	190	86	65	21	224	3.3
" 31.....	45	10.0	13.0	0.50	0.60	44	65	65	47	18	180	5.7
Average....	46	16.0	11.0	0.39	1.00	64	161	79	63	16	203	3.6

Analyses of Influent to Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia.	Nitrogen: Nitrites.	Nitrogen: Nitrates.	Oxygen Consumed	Chlorine.	Suspended Matter: Total.	Suspended Matter: Volatile.	Suspended Matter: Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
Feb. 4.....	47	34.0	12	0.40	1.20	138	234	750	432	318	228	1.3
" 5.....	47	29.0	10	0.30	0.90	124	250	530	254	276	208	1.8
" 8.....	46	32.0	12	0.40	0.60	151	228	812	464	348	252	1.5
" 9.....	46	34.0	12	0.55	0.45	148	254	582	360	222	228	0.7
" 12.....	46	31.0	12	0.50	0.50	130	250	440	292	148	244	0.2
" 13.....	47	34.0	11	0.55	1.05	140	204	680	354	326	236	1.7
" 16.....	45	18.0	13	0.30	1.30	87	134	338	124	214	212	6.1
" 17.....	45	22.0	11	0.30	1.40	99	194	398	164	234	204	1.6
" 21.....	42	8.4	10	0.40	2.70	44	42	170	138	32	164	7.3
" 22.....	45	22.0	10	0.70	2.20	88	110	456	228	228	236	2.7
Average....	46	26.0	11	0.44	1.20	115	190	516	281	235	221	2.5

Analyses of Effluent from Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia.	Nitrogen: Nitrites.	Nitrogen: Nitrates.	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
		Parts per Million										
Feb. 4.....	47	18.0	12.0	0.15	1.60	78	222	87	68	19	212	1.7
" 5.....	46	17.0	10.0	0.20	1.10	74	236	92	71	21	212	1.7
" 8.....	47	19.0	9.0	0.15	1.75	82	198	77	77	0	192	1.7
" 9.....	46	20.0	9.0	0.15	1.55	66	206	112	64	48	200	3.9
" 12.....	47	20.0	11.0	0.20	1.20	82	222	88	76	12	212	2.9
" 13.....	46	16.0	10.0	0.30	1.50	75	204	88	78	10	200	4.1
" 16.....	46	14.0	8.4	0.35	1.35	64	122	68	58	10	192	4.7
" 17.....	45	17.0	9.0	0.25	1.45	70	160	46	46	0	192	3.7
" 21.....	41	6.0	6.0	0.25	2.55	24	48	66	66	0	148	8.7
" 22.....	44	8.0	14.0	0.25	2.65	60	110	74	60	14	184	4.5
Average.	46	16.0	9.8	0.23	1.70	68	173	80	66	14	194	3.8

Analyses of Influent to Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen. Organic.	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Chlorine.	Suspended Matter Total.	Suspended Matter Volatile.	Suspended Matter Fixed.	Alkalinity in Terms of Ca. Co. 3	Oxygen Dissolved
					Parts per Million							
Mch. 2.....	46	19	9.9	0.55	1.40	96	158	260	179	81	198	1.3
" 6.....	45	24	11.0	0.40	0.90	96	172	257	178	79	242	3.0
" 10.....	46	24	12.0	0.38	1.60	90	156	237	156	81	206	2.7
" 14.....	45	14	16.0	0.13	0.80	60	91	172	114	58	218	3.9
" 18.....	46	23	13.0	0.80	0.65	83	151	242	144	98	224	4.1
" 22.....	44	18	11.0	0.30	1.70	72	75	296	136	160	176	5.9
" 26.....	44	17	10.0	0.45	1.80	73	97	212	130	82	208	4.1
" 30.....	44	20	7.0	0.48	2.60	87	101	382	174	208	208	3.6
Average.	45	20	11.0	0.44	1.40	82	125	257	151	106	210	3.6

Analyses of Effluent from Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Chlorine.	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
					Parts per Million							
Mch. 2.....	45	17	09.3	0.20	1.9	64	126	96	72	24	196	4.2
" 6.....	44	17	12.0	0.20	0.5	62	190	84	58	26	204	3.8
" 10.....	45	19	11.0	0.90	1.2	62	162	82	58	24	192	3.7
" 14.....	44	11	14.0	0.35	1.4	46	94	106	68	38	184	4.8
" 18.....	45	18	11.0	0.40	1.8	60	148	86	62	24	192	4.3
" 22.....	43	13	12.0	0.15	1.9	51	72	76	52	24	176	5.9
" 26.....	43	13	12.0	0.30	2.4	52	94	70	60	10	192	4.9
" 30.....	43	13	09.4	1.00	1.6	58	102	118	80	38	200	5.3
Average....	44	15	11.0	0.44	1.6	57	124	90	64	26	192	4.6

Analyses of Influent to Settling Tank.

1909 Date.	Temp. Deg. F.	Nitrogen. Organic.	Nitrogen. Free Ammonia.	Nitrogen. Nitrites.	Nitrogen. Nitrates.	Oxygen Consumed	Chlorine	Suspended Matter Total.	Suspended Matter Volatile.	Suspended Matter Fixed.	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
						Parts per Million						
April 3.....	43	16.0	7.0	0.95	1.20	72	62	284	141	143	208	3.2
" 7.....	44	16.0	5.7	0.48	1.90	67	100	247	127	120	174	3.8
" 11.....	45	8.9	12.0	1.60	0.88	72	75	123	103	20	200	4.5
" 15.....	46	16.0	5.8	0.46	2.40	80	99	243	136	107	186	3.7
" 19.....	47	15.0	9.2	0.40	2.40	75	90	190	110	80	186	0.8
" 23.....	47	32.0	11.0	0.45	1.90	119	130	807	360	447	184	1.5
" 27.....	48	29.0	11.0	0.40	1.60	104	171	622	355	267	202	3.8
Average..	46	19.0	8.8	0.68	1.80	84	104	359	190	169	191	3.0

Note—Each sample covers 48 hours.

Analyses of Effluent from Settliing Tank.

1909 Date	Temp. Deg. F.	Nitrogen Organic.	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total.	Suspended Matter Volatile.	Suspended Matter Fixed.	Alkalinity in Terms of Ca. Co. 3
					Parts per Million					
April 3.....	43	8.3	9.7	1.80	0.00	48	76	58	18	1.6
" 7.....	44	7.4	9.0	1.00	1.10	38	58	44	14	4.5
" 11.....	43	11.0	9.0	1.30	1.30	40	72	64	8	7.8
" 15.....	45	11.0	6.7	1.60	0.90	43	76	60	16	5.4
" 19.....	45	14.0	10.0	0.20	2.60	48	76	62	14	3.4
" 23.....	47	19.0	9.4	0.25	2.30	57	102	34	68	2.7
" 27.....	46	21.0	10.0	0.30	2.30	62	102	74	28	5.7
Average..	45	13.1	9.1	0.92	1.5	48	80	56	24	4.4

Analyses of Influent to Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Oxygen Dissolved
						Parts per Million						
May 5.....	48	29	10.0	0.78	1.4	103	178	507	239	268	224	0.7
" 9.....	49	18	12.0	0.85	1.4	68	107	220	139	81	202	5.0
" 13.....	51	27	10.0	0.48	1.9	104	187	613	248	365	198	1.8
" 17.....	51	22	11.0	0.43	1.4	70	117	510	235	275	238	4.9
" 21.....	53	32	9.0	0.53	1.4	109	195	811	308	503	202	1.2
" 25.....	53	28	13.0	0.50	1.0	106	205	513	245	268	210	4.6
" 28.....	54	42	11.0	0.40	1.2	111	201	702	301	401	210	0.1
Average....	51	28	11.0	0.57	1.4	96	170	554	245	309	212	2.6

Analyses of Effluent from Settling Tank.

1909 Date	Temp. Deg. F.	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca. Co. 3	Oxygen Dissolved
						Parts per Million						
May 1.....	47	12	11.0	2.40	0.0	50	152	114	66	48	208	5.6
" 5.....	48	21	9.0	0.30	2.1	58	162	92	64	28	204	3.0
" 9.....	50	14	12.0	1.40	0.2	44	110	100	82	18	228	4.2
" 13.....	51	21	9.0	0.35	2.6	57	186	106	76	30	200	3.5
" 17.....	52	10	12.0	1.00	1.4	41	106	90	54	36	200	5.2
" 21.....	53	18	9.7	1.10	1.2	58	194	118	78	40	200	2.2
" 25.....	54	18	13.0	1.80	0.1	62	186	102	74	28	232	0.48
" 28.....	56	21	11.0	1.80	1.4	48	208	112	66	46	212	1.8
Average....	51	17	10.8	1.27	1.1	52	163	104	70	34	210	3.2

Analyses of Influent to Settling Tank.

1909 Date	Temp. Deg. F.	Parts per Million											
		Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter.			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
June 1.....	55	27	12	0.25	1.45	100	210	296	184	112	240	1.7
" 5.....	56	37	12	0.53	0.43	103	178	467	225	242	236	2.1
" 9.....	56	42	13	0.78	0.68	109	239	629	295	334	224	1.4
" 13.....	56	22	15	0.50	0.30	85	114	473	224	249	206	2.3
" 17.....	57	36	12	0.73	0.33	124	213	1006	387	619	222	1.6
" 22.....	58	37	13	0.43	0.53	122	189	706	336	370	254	1.0
" 26.....	59	28	14	0.15	0.55	98	237	422	256	166	266	1.6
" 30.....	60	30	17	0.21	0.67	100	264	451	288	163	246	1.9
Average....	57	32	14	0.45	0.62	105	206	556	274	282	237	1.7

Analyses of Effluent from Settling Tank.

1909 Date	Temp. Deg. F.	Parts per Million										
		Nitrogen				Oxygen Consumed	Chlorine	Suspended Matter.			Alkalinity in Terms of Ca Co 3	Oxygen Dissolved.
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
June 1.....	55	16	15	0.45	0.00	59	192	104	86	18	240	0.9
" 5.....	58	20	17	0.00	0.10	53	184	140	90	50	244	0.3
" 9.....	57	23	16	0.55	0.55	65	238	124	98	26	228	0.3
" 13.....	57	9.8	14	0.05	0.25	42	114	94	62	32	212	1.5
" 17.....	59	10	18	0.05	0.00	52	212	82	62	20	224	1.0
" 22.....	63	16	17	0.10	0.30	59	182	110	84	26	248	0.4
" 26.....	62	16	17	0.03	0.78	56	236	110	86	24	264	0.0
" 30.....	63	14	20	0.06	0.21	56	264	104	86	18	248	0.0
Average....	60	16	17	0.16	0.27	55	203	108	82	26	238	0.5

Appendix I.

Results of Analyses of Influent and Effluent of Sprinkling Filter No. 1.

Influent.

1908 Date	Parts per Million: Nitrogen. Organic	Nitrogen. Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites.	Nitrates.
Aug. 25	14.0	16	67	220	132	88	0.00	0.00
" 26	12.0	15	64	163	98	65	0.01	0.01
" 27	15.0	14	60	142	96	46	0.04	0.23
" 28	12.0	14	50	76	57	19	0.03	0.29
" 29	11.0	14	52	84	63	21	0.12	0.00
" 30	6.2	14	36	67	49	18	0.24	0.03
" 31	15.0	15	62	105	81	24	0.20	0.07
Average	12.0	15	56	122	82	40	0.09	0.09

Sept. 1	11.0	16	62	103	80	23	0.24	0.18
" 2	11.0	16	62	86	61	25	0.16	0.26
" 3	11.0	15	62	93	70	23	0.12	0.15
" 4	9.8	15	56	88	66	22	0.14	0.18
" 5	10.0	14	55	103	70	33	0.08	0.29
" 6	6.0	14	33	82	60	22	0.12	0.15
" 7	7.8	15	38	73	59	14	0.02	0.05
" 8	14.0	16	65	106	78	28	0.10	0.02
" 9	12.0	17	65	87	65	22	0.18	0.06
" 12	11.0	16	69	101	72	29	0.04	0.13
" 13	8.0	16	55	77	59	18	0.08	0.04
" 14	14.0	17	66	112	88	24	0.10	0.17
" 15	12.0	17	64	98	67	31	0.11	0.00
" 16	10.0	18	68	106	75	31	0.09	0.00
" 17	14.0	16	85	84	60	24	0.07	0.00
" 18	14.0	16	78	113	80	33	0.12	0.14
" 19	12.0	18	68	118	78	40	0.07	0.04
" 26	12.0	17	80	118	85	33	0.10	0.00
" 27	6.9	16	36	86	61	25	0.08	0.03
" 28	11.0	17	66	137	82	55	0.22	0.00
" 29	14.0	16	80	148	93	55	0.30	0.14
" 30	12.0	16	74	182	118	64	0.12	0.04
Average	11.0	16	63	105	74	31	0.12	0.09

Effluent.

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Oxygen Dissolved	Putrescibility
	Parts per Million										
Aug. 25.....	0.60	6.6	12	0.90	0.03	30	32	32	0	5.3	
" 26.....	0.60	6.6	12	0.80	0.89	22	29	23	6	5.8	
" 27.....	0.60	5.2	11	1.40	0.03	28	24	19	5	5.4	
" 28.....	0.60	5.9	11	1.00	1.15	24	9	9	0	6.0	
" 29.....	0.60	5.5	11	1.00	1.60	20	17	17	0	4.8	
" 30.....	0.60	1.9	11	1.20	2.10	18	13	11	2	7.1	
" 31.....	0.60	5.8	10	1.20	2.40	22	22	22	0	4.8	
Average....	0.60	5.3	11	1.7	1.2	23	21	19	2	5.6	
Sept. 1.....	0.60	2.1	12.0	2.00	1.10	24	20	19	1	5.1	+
" 2.....	0.60	1.2	12.0	1.60	2.30	26	14	13	1	5.3	−
" 3....	0.60	2.0	12.0	2.60	0.00	27	25	24	1	4.9	+
" 4.....	0.60	2.4	10.0	1.40	1.80	22	11	11	0	5.8	−
" 5.....	0.60	1.8	11.0	1.00	3.00	27	17	15	2	3.5	+
" 6.....	0.60	1.4	9.0	1.20	4.00	14	10	9	1	5.6	+
" 7.....	0.60	1.8	9.0	1.10	3.90	17	12	9	3	6.0	+
" 8.....	0.60	1.6	8.0	1.00	3.90	22	19	17	2	6.8	+
" 9.....	0.60	1.4	9.0	1.00	4.30	17	14	13	1	...	
" 12.....	0.60	1.2	8.0	0.80	5.60	21	10	9	1	3.4	+
" 13.....	0.60	2.0	6.0	1.40	6.90	16	8	6	2	3.8	+
" 14.....	0.60	1.6	6.0	1.10	8.20	17	5	5	0	3.8	+
" 15.....	0.60	1.2	8.4	1.40	7.10	17	4	4	0	5.3	+
" 16.....	0.60	1.5	7.7	1.40	7.10	17	6	4	2	3.8	+
" 17.....	0.60	1.5	5.7	1.40	6.30	17	5	5	0	3.7	+
" 18.....	0.60	1.6	6.0	1.40	7.90	17	7	5	2	...	+
" 19.....	0.60	1.0	7.4	1.40	6.90	13	11	5	6	6.2	+
" 26.....	0.60	3.2	7.7	2.40	8.50	33	37	28	9	6.2	+
" 27.....	0.60	1.4	5.4	1.60	8.10	14	10	8	2	6.3	+
" 28.....	0.60	1.3	4.0	1.00	6.90	18	14	7	7	4.2	+
" 29.....	0.60	0.9	6.0	0.80	7.50	18	10	6	4	5.3	+
" 30.....	0.60	0.8	5.7	0.80	7.50	19	12	10	2	6.9	+
Average....	0.60	1.6	8.0	1.4	5.4	20	13	11	2	5.1	

Influent.

1908 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Oct. 2.....	54	52	11.0	14	74	106	70	36	0.32	0.00	0.0
" 4.....	56	53	12.0	13	47	156	102	54	0.70	0.24	0.0
" 5.....	57	53	15.0	15	80	172	118	54	0.08	0.21	0.0
" 6.....	57	54	13.0	14	61	130	86	44	0.90	0.20	0.0
" 7.....	58	53	14.0	16	71	112	76	36	0.80	0.16	0.0
" 8.....	58	55	14.0	14	69	126	86	40	0.90	0.15	0.0
" 9.....	58	57	12.0	16	68	102	70	32	0.40	0.02	0.0
" 10.....	57	55	16.0	14	70	118	80	38	0.22	0.12	0.0
" 11.....	56	56	8.5	14	45	126	62	64	0.04	0.22	0.0
" 15.....	57	52	14.0	13	67	99	69	30	0.07	0.17	0.0
" 16.....	57	57	15.0	14	74	144	90	54	0.07	0.22	0.0
" 17.....	57	56	13.0	16	71	152	100	52	0.10	0.14	0.0
" 18....	57	57	8.1	17	55	118	78	40	0.07	0.12	0.0
" 19.....	57	56	15.0	16	78	142	98	44	0.11	0.20	0.0
" 20.....	55	50	15.0	17	78	63	47	16	0.12	0.14	0.0
" 21.....	55	48	12.0	16	72	126	78	48	0.20	0.20	0.0
" 25.....	57	58	5.1	16	51	90	66	24	0.01	0.15	0.0
26.. .	57	58	11.0	15	75	136	90	46	0.12	0.28	0.0
27.....	57	58	9.7	16	69	118	82	36	0.12	0.10	0.0
" 28.....	56	56	12.0	13	69	130	84	46	0.10	0.20	0.0
" 29.....	56	56	11.0	14	66	96	68	28	0.14	0.15	0.0
" 30.....	54	53	12.0	17	78	196	130	66	0.08	0.29	0.0
" 31.....	53	48	11.0	16	66	112	98	14	0.08	0.21	0.0
Average..	56	54	12.0	15	67	125	84	41	0.25	0.17	0.0

Effluent.

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Oxygen Dissolved	Putrescibility
		Parts per Million									
Oct. 2	0.6	3.7	6.4	1.1	8.4	26	27	19	8	6.4	+
" 4.....	0.6	1.3	6.4	1.4	6.7	13	15	14	1	6.0	+
" 5.....	0.6	2.9	6.4	1.2	6.5	24	21	17	4	6.9	+
" 6.....	0.6	2.8	5.7	1.2	7.7	25	19	15	4	7.2	+
" 7.....	0.6	1.3	8.0	1.2	7.9	24	18	14	4	7.0	+
" 8.....	0.6	1.9	7.0	1.8	8.3	24	28	22	6	8.0	+
" 9....	0.6	1.0	8.7	1.6	7.5	23	20	13	7	7.2	+
" 10.....	0.6	1.7	6.0	1.6	8.4	25	21	15	6	6.6	+
" 11.....	0.6	2.2	4.7	2.0	8.0	21	40	16	24	7.6	+
" 15.....	0.6	1.4	6.7	2.4	8.6	22	34	19	15	8.3	+
" 16.....	0.6	1.9	5.0	1.6	8.0	18	23	13	10	12.0	+
" 17.....	0.6	3.1	5.0	1.6	8.1	19	21	12	9	9.3	+
" 18.....	0.6	2.8	9.7	2.2	8.8	11	17	11	6	9.4	+
" 19.....	0.6	2.2	4.7	2.0	9.0	19	17	13	4	9.8	+
" 20.....	1.00	3.1	5.0	1.4	8.1	19	19	11	8	8.1	+
" 21.....	1.00	3.7	4.4	1.6	7.5	24	73	32	41	7.2	+
" 25.....	1.00	1.3	6.0	2.2	6.7	15	13	10	3	6.6	+
" 26.....	1.00	1.6	5.3	1.8	6.5	17	8	8	0	7.0	+
" 27.....	1.00	1.4	6.7	2.0	5.3	18	12	12	0	6.2	+
" 28.....	1.00	2.5	6.0	2.0	5.9	18	5	5	0	6.4	+
" 29.....	1.00	1.5	7.0	1.6	5.5	18	3	3	0	8.4	+
" 30.....	1.00	1.0	6.3	1.6	5.7	15	3	3	0	7.6	+
" 31.....	1.00	1.4	8.7	1.0	5.6	20	20	20	0	5.4	+
Average..		2.1	6.3	1.7	7.3	20	21	14	7	7.6	

Influent.

1908 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Nov. 1.....	51	45	8.3	16	50	112	76	36	.08	0.18	0.00
" 2.....	51	42	13.0	15	74	156	86	70	.08	0.29	0.00
" 4.....	52	45	17.0	14	67	112	76	36	.70	0.40	0.20
" 5.....	52	46	18.0	18	80	130	86	44	.70	0.23	0.00
" 6.....	51	47	16.0	13	72	120	80	40	.50	0.43	0.00
" 7.....	52	48	17.0	13	64	98	72	26	.50	0.43	0.53
" 8.....	51	50	8.8	15	43	98	76	22	.10	0.16	1.70
" 9.....	51	50	14.0	15	67	90	68	22	.60	0.27	0.67
" 10.....	52	50	14.0	15	68	112	82	30	.50	0.12	1.60
" 12.....	51	51	15.0	16	71	122	90	32	.45	0.37	1.20
" 13.....	52	51	12.0	22	65	108	82	26	.25	0.47	0.76
" 14.....	52	50	15.0	16	72	108	80	28	.10	0.37	0.26
" 15.....	50	50	9.7	15	48	104	84	20	.04	0.20	0.00
" 16.....	50	48	18.0	12	70	114	92	22	.25	1.00	0.80
" 17.....	50	49	15.0	14	72	118	92	26	.40	0.60	2.30
" 19.....	50	48	14.0	15	73	152	98	54	.40	0.37	1.10
" 20.....	51	50	13.0	16	69	110	68	42	.50	0.32	0.46
" 21.....	50	49	16.0	15	58	92	92	00	.35	0.32	0.33
" 23.....	52	49	13.0	15	66	138	104	34	.05	0.47	1.10
" 24.....	51	50	15.0	17	73	130	94	36	.08	0.29	0.99
" 26.....	51	52	10.0	15	41	262	194	68	.20	0.17	0.60
" 27.....	51	51	15.0	18	76	144	112	32	.35	0.52	0.18
" 28.....	51	51	15.0	17	73	110	62	48	.24	0.58	0.60
" 29.....	50	50	7.4	17	41	102	66	36	.18	0.82	0.59
" 30.....	50	47	18.0	14	79	190	100	90	.35	1.10	1.90
Average...	51	49	14.0	16	65	125	88	37	0.32	0.42	0.71

Effluent.

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Suspended Matter: Total	Volatile	Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
Nov. 1.....	1	2.0	7.7	1.0	5.2	14	32	8	24	14	6.9	+
" 2.....	1	6.8	7.7	1.0	4.6	26	68	33	35	26	8.0	+
" 4.....	1	7.1	9.0	1.4	5.2	30	69	42	27	30	6.9	+
" 5.....	1	4.3	11.0	1.2	4.2	30	36	27	9	30	6.6	+
" 6.....	1	5.2	8.7	1.2	4.8	27	29	26	3	27	6.4	+
" 7.....	1	6.1	7.4	1.2	4.0	21	22	11	11	21	6.1	+
" 8.....	1	2.5	7.4	1.2	6.1	15	13	13	0	15	7.8	+
" 9.....	1	2.7	7.6	1.4	5.7	22	18	12	6	22	6.1	+
" 10.....	1	2.1	8.2	1.1	4.9	18	13	13	0	18	5.4	+
" 12.....	1	6.9	9.4	1.2	6.7	28	46	36	10	28	5.6	+
" 13.....	1	2.9	9.0	1.0	6.5	21	18	17	1	21	3.2	+
" 14.....	1	2.9	7.4	1.1	5.7	19	11	11	0	19	6.9	+
" 15.....	1	1.2	6.7	1.1	5.7	13	13	13	0	13	5.9	+
" 16.....	1	2.5	7.7	1.1	5.7	19	14	14	0	19	5.1	+
" 17.....	1	3.1	6.7	1.0	5.6	20	3	3	0	20	4.0	+
" 19.....	1	4.5	7.7	1.2	7.1	24	21	18	3	24	5.1	+
" 20.....	1	2.0	7.4	1.0	6.3	17	10	9	1	17	4.9	+
" 21.....	1	2.4	7.0	0.9	6.6	16	6	6	0	16	4.2	+
" 23.....	1	1.6	7.0	1.0	7.1	17	14	13	1	17	7.4	+
" 24.....	1	2.8	7.0	1.1	4.9	24	21	14	7	24	6.4	+
" 26.....	1	1.5	8.7	1.1	7.8	16	13	13	0	16	5.0	+
" 27.....	1	1.4	10.0	1.0	2.7	23	19	19	0	23	5.0	+
" 28.....	1	3.1	8.7	0.9	6.4	21	19	10	9	21	4.9	+
" 29.....	1	1.9	6.7	0.9	7.4	13	12	9	3	13	6.5	+
" 30.....	1	4.7	8.7	1.0	6.5	23	19	13	6	23	5.5	+
Average....		3.4	8.0	1.1	5.7	21	22	16	6	21	5.8	

Influent

1908 Date	Parts per Million: Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Dec. 1.....	50	50	18	14.0	72	140	98	42	0.30	1.30	3.2
" 5.....	50	48	15	11.0	60	184	67	117	0.30	0.90	2.6
" 7.....	48	46	14	8.7	46	62	53	9	0.20	1.30	6.0
" 8.....	48	46	15	9.4	58	53	42	11	0.25	1.55	4.5
" 10.....	48	46	13	12.0	58	79	61	18	0.40	0.60	5.3
" 12.....	48	46	12	12.0	59	59	43	16	0.35	2.55	2.7
" 14.....	47	47	10	14.0	57	68	54	14	0.40	0.40	1.0
" 16.....	48	47	17	14.0	55	79	61	18	0.70	0.50	2.0
" 18.....	48	46	13	16.0	53	...	..	...	0.20	....	1.4
" 20.....	47	46	10	15.0	32	58	52	6	0.10	0.30	5.9
" 22.....	48	46	14	14.0	56	63	51	12	0.40	0.30	3.1
" 23.....	47	46	11	13.0	53	78	64	14	0.25	0.65	3.2
" 27.....	46	46	12	17.0	32	68	65	3	0.10	0.40	5.4
" 29.....	48	46	16	13.0	69	86	80	6	1.60	0.00	2.5
" 31.....	47	46	19	13.0	67	83	67	16	0.25	1.45	2.2
Average....	48	47	14	13.0	55	83	61	22	0.38	0.87	3.4

Effluent

1908 Date	Parts per Million: Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed			
Dec. 1.....	1.18	2.3	7.7	1.0	4.4	23	29	24	5	4.9	5.3	+
" 5.....	1.18	9.0	7.6	1.3	7.0	32	52	42	10	7.5	6.0	−
" 7.....	1.18	3.6	7.0	0.6	6.0	17	20	20	0	4.9	6.8	+
" 8.....	1.18	2.8	7.4	0.6	4.8	20	17	16	1	6.2	6.6	+
" 10.....	1.18	4.5	7.7	1.0	5.2	22	19	17	2	8.2	7.2	+
" 12.....	1.18	1.9	8.7	0.9	4.3	29	30	27	3	6.0	7.7	+
" 14.....	1.18	5.3	7.7	1.0	4.4	20	19	13	6	5.0	5.3	+
" 16.....	1.18	2.9	9.0	1.2	4.2	23	34	27	7	5.5	6.4	+
" 18.....	1.18	3.9	10.0	1.4	...	21	..	..	..	6.8	6.3	+
" 20.....	1.18	3.1	8.4	1.3	5.5	14	24	20	4	2.9	8.2	+
" 22.....	1.18	3.1	10.0	1.4	3.5	21	38	29	9	5.0	7.4	+
" 23.....	1.18	1.1	12.0	1.5	2.1	24	31	26	5	5.0	6.9	+
" 27.....	1.18	2.7	10.0	2.2	4.4	14	26	25	1	3.7	8.5	+
" 29.....	1.18	5.7	9.0	1.6	3.5	24	37	37	0	5.5	7.1	+
" 31.....	1.18	5.7	11.0	2.2	4.2	29	48	41	7	6.2	7.1	+
Average....	....	3.8	8.9	1.3	4.5	22	30	26	4	5.6	6.8	

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Jan. 3.....	46	44	13	17.0	44	73	68	5	0.88	0.27	4.9
" 7.....	45	44	15	9.2	60	70	54	16	0.23	1.95	2.7
" 11.....	46	44	11	15.0	60	77	62	15	0.63	0.52	4.2
" 15.....	48	46	20	12.0	77	93	77	16	0.40	0.95	2.4
" 19.....	46	44	17	13.0	71	96	72	24	0.25	1.00	0.9
" 23.....	48	46	23	11.0	80	145	82	63	0.28	1.10	1.6
" 27.....	46	46	17	8.3	76	78	52	26	0.30	1.60	2.8
Average....	46	45	17	12	67	90	67	23	.42	1.06	2.8

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
						Parts per Million						
Jan. 3.....	1.18	2.3	12.0	2.0	2.9	14	29	28	1	4.0	8.2	+
" 7.....	1.18	1.8	9.4	1.6	2.0	24	25	22	3	5.0	7.0	+
" 11.....	1.18	5.0	11.0	1.6	1.0	23	34	25	9	5.1	8.5	+
" 15.....	1.18	2.8	12.0	1.8	2.8	30	36	33	3	6.9	7.3	+
" 19.....	1.18	5.8	11.0	1.6	2.0	38	43	33	10	9.7	6.2	−
" 23.....	1.18	5.4	11.0	1.8	2.2	28	35	29	6	8.3	4.7	*
" 27.....	1.18	6.6	9.0	1.6	1.7	33	33	27	6	9.6	6.0	+
Average....	....	4.2	10.8	1.7	2.1	27	33	28	5	6.9	6.8	

*Putrescible on the 22d and stable on 23d.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter. Total	Suspended Matter. Volatile	Suspended Matter. Fixed	Nitrites	Nitrates	Oxygen Dissolved
	Parts per Million										
Feb. 2.....	46	44	18.0	11.0	73	92	73	19	0.85	0.45	1.50
" 7.....	45	44	15.0	12.0	52	81	66	15	0.55	1.20	4.40
" 11.....	46	44	20.0	10.0	74	116	75	41	0.58	1.10	2.30
" 15.....	45	44	17.0	10.0	60	90	69	21	0.20	1.60	4.80
" 19.....	46	44	17.0	10.0	62	82	62	20	0.20	1.70	3.60
" 28.....	44	43	11.0	8.7	50	56	48	8	0.40	3.10	6.40
Average.	45	44	16	10	62	86	66	20	.46	1.5	3.8

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
	Parts per Million											
Feb. 2.....	1.18	5.0	10.0	1.60	2.00	30	33	27	6	9.0	6.8	*
" 7.....	1.18	2.9	10.0	1.80	2.40	23	23	22	1	5.2	6.7	†
" 11.....	1.18	5.0	11.0	1.60	2.40	29	30	27	3	6.9	6.4	†
" 15.....	1.18	4.2	11.0	1.60	2.70	27	23	23	0	5.5	6.3	*
" 19.....	1.18	3.8	11.0	1.80	2.20	24	28	28	0	5.9	6.3	*
" 28.....	1.18	2.3	5.7	1.60	4.60	17	26	23	3	2.8	8.2	†
Average..	....	3.9	9.8	1.7	2.7	25	27	25	2	5.9	6.8	

*Stable on 1st and putrescible on 2nd.
Stable on 14th and putrescible on 15th.
Stable on 19th and putrescible on 18th.

Influent

1909 Date.	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Mar. 4.....	45	44	17	11	60	·98	88	10	1.10	0.90	3.6
" 8.....	44	43	15	11	60	·86	64	22	0.35	1.75	5.3
" 12.....	45	44	18	10	61	·96	74	22	0.30	1.30	3.8
" 16.....	44	43	16	10	57	1.04	90	14	0.90	1.30	3.6
" 20.....	45	43	15	11	55	·94	74	20	0.25	1.95	4.3
" 24.....	42	42	13	9	52	·80	58	22	0.20	2.30	3.7
" 28.....	43	43	12	9	38	·64	42	22	0.40	2.20	4.1
Average....	44	43	15	10	55	·89	70	19	.50	1.7	4.1

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
						Parts per Million						
Mar. 4.....	1.18	3.0	9.0	2.0	2.0	25	29	29	00	4.8	6.5	+
" 8.....	1.18	3.8	11.0	1.8	3.1	28	35	24	11	6.0	6.8	+
" 12.....	1.18	4.3	9.7	1.6	2.3	27	38	26	12	7.0	6.3	+
" 16.....	1.18	4.6	9.0	2.2	2.5	26	31	31	00	3.7	6.5	+
" 20.....	1.18	3.0	11.0	1.8	4.2	27	38	30	8	5.9	6.8	+
" 24.....	1.18	5.2	8.0	1.6	3.1	21	20	18	2	4.0	6.3	+
" 28.....	1.18	4.0	7.4	1.6	3.5	22	21	15	6	4.0	7.5	+
Average....	....	4	9.3	1.8	3.0	25	30	25	5	5.1	6.7	

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
	Parts per Million										
Apr. 1.....	43	43	15.0	7.0	45	86	58	28	0.25	2.60	4.0
" 5.....	43	42	9.2	8.0	43	72	56	16	0.50	2.30	6.8
" 9.....	44	44	9.0	9.0	56	76	54	22	1.80	0.60	4.1
" 13.....	45	44	14.0	10.0	55	96	72	24	0.40	1.60	3.1
" 17.....	46	46	9.4	14.0	44	72	58	14	2.40	0.00	4.1
" 21.....	47	48	20.0	10.0	58	108	62	46	0.80	2.00	2.9
" 25.....	46	46	12.0	9.7	48	74	56	18	0.30	2.10	7.3
" 29.....	47	45	19.0	11.0	57	80	58	22	0.35	2.10	4.7
Average....	45	45	13.4	9.8	51	83	59	24	0.85	1.7	4.6

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia.	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Volatile	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
		Parts per Million										
Apr. 1.....	1.18	3.0	6.0	1.6	0.9	21	29	26	3	4.1	6.5	+
" 5.....	1.18	4.8	5.4	1.4	4.0	27	92	66	26	5.3	8.3	+
" 9.....	1.18	4.2	6.0	1.6	2.6	23	57	44	13	4.5	6.5	+
" 13.....	1.18	3.4	8.0	2.0	2.0	23	39	32	7	4.3	6.5	+
" 17.....	1.18	4.2	7.0	1.6	7.0	21	52	38	14	3.6	5.9	+
" 21.....	1.18	3.7	8.7	2.4	2.6	21	42	27	15	4.5	6.0	+
" 25.....	1.18	2.4	6.4	1.6	4.6	19	20	13	7	3.3	8.1	+
" 29.....	1.18	4.7	7.7	1.6	5.4	20	27	21	6	3.9	7.4	+
Average....	....	3.8	6.9	1.7	3.6	22	45	33	12	4.2	6.9	

Note—Each sample covers 48 hours.

Influent

1909 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
May 3.....	47	44	12	10.0	40	88	66	22	0.50	0.9	3.1
" 7.....	50	52	22	11.0	57	116	70	46	1.20	0.8	3.8
" 11.....	52	54	16	10.0	57	124	58	66	0.30	2.0	2.4
" 15.....	53	57	23	12.0	59	122	88	34	2.00	0.1	3.2
" 19.....	52	54	21	11.0	62	108	76	32	0.40	2.2	2.3
" 23.....	52	52	17	13.0	45	98	82	16	0.40	0.2	3.0
" 27.....	55	55	19	12.0	64	140	92	48	0.35	1.3	0.63
Average....	52	53	19	11	55	114	76	38	0.74	1.1	2.6

(Parts per Million)

Effluent

1909 Date	Nitrogen				Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Suspended Matter			Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
	Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed				
May 3.....	4.4	6.4	1.6	3.9	21	4.6	62	46	16	8.3	+	10′	1½″–2″
" 7.....	5.4	7.0	2.0	2.1	21	4.2	44	31	13	8.0	+	...	....
" 11.....	6.8	6.0	2.2	5.1	28	4.4	69	47	22	5.1	+	...	....
" 15.....	12.0	7.0	2.4	2.4	40	10.0	160	108	52	4.9	*	...	....
" 19.....	8.5	6.0	2.2	5.1	30	6.2	79	60	19	6.7	+	...	....
" 23.....	4.0	5.7	2.0	5.8	18	4.2	35	29	6	6.4	+	...	....
" 27.....	5.0	6.7	1.8	1.9	27	5.4	41	33	8	3.9		...	....
Average..	6.6	6.4	2.0	3.8	26	5.6	70	51	19	6.2		...	....

(Parts per Million)

+ on the 14th.
* on the 15th.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
June 3.....	57	58	24	15	64	122	90	32	0.45	0.95	1.1
" 7.....	57	58	15	14	51	82	62	20	0.35	0.55	0.7
" 11.....	57	58	22	12	64	134	80	54	0.60	0.70	0.4
" 15.....	57	60	15	16	54	92	62	30	0.80	0.00	1.3
" 19.....	56	56	15	18	56	92	70	22	0.00	0.20	0.6
" 24.....	62	67	17	19	58	94	78	16	0.05	0.45	0.0
" 28.....	61	65	12	16	39	48	46	2	0.04	0.56	0.0
Average....	58	60	17	16	55	95	70	25	0.33	0.49	0.6

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Depth of Filter	Size of Filtering Material
June 3.....	1.18	7.9	7.0	2.0	4.7	34	66	51	15	6.2	5.7	10′	1½″-2″
" 7.....	1.18	7.2	5.7	2.2	2.3	29	84	64	20	5.4	6.8	...	....
" 11.....	1.18	6.2	6.7	1.8	4.5	30	88	60	28	6.0	5.1	...	....
" 15.....	1.18	5.9	5.4	2.0	4.8	29	92	50	42	5.1	6.7	...	....
" 19.....	1.18	7.4	5.7	1.6	8.6	31	88	58	30	5.6	8.0	...	....
" 24.....	1.18	5.6	7.4	1.6	4.7	32	80	60	20	7.3	5.3	...	....
" 28.....	1.18	3.0	4.0	1.8	7.1	12	23	17	6	2.4	6.2	...	....
Average..	....	6.2	6.0	1.9	5.2	28	74	51	23	5.4	6.3	...	....

Appendix J.

Results of Chemical Analyses of Influent and Effluent of Sprinkling Filter No. 2.

Influent

1908 Date	Parts per Million							
	Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates
	Organic	Free Ammonia		Total	Volatile	Fixed		
Sept. 2.....	11.0	16	62	86	61	25	0.16	0.26
" 3.....	11.0	15	62	93	70	23	0.12	0.15
" 4.....	9.8	15	56	88	66	22	0.14	0.18
" 5.....	10.0	14	55	103	70	33	0.08	0.29
" 6.....	6.0	14	33	82	60	22	0.12	0.15
" 7.....	7.8	15	38	73	59	14	0.02	0.05
" 8.....	14.0	16	65	106	78	28	0.10	0.02
" 9.....	12.0	17	65	87	65	22	0.18	0.06
" 10.....	10.0	16	76	145	105	40	0.30	0.02
" 14.....	14.0	17	66	112	88	24	0.10	0.17
" 15.....	12.0	17	64	98	67	31	0.11	0.00
" 16.....	10.0	18	68	106	75	31	0.09	0.00
" 21.....	16.0	17	77	131	99	32	0.12	0.07
" 22.....	13.0	18	81	132	92	40	0.12	0.02
" 23.....	12.0	17	78	110	79	31	0.11	0.03
" 24.....	15.0	15	82	102	74	28	0.20	0.40
" 25.....	14.0	17	87	156	106	50	0.18	0.01
" 26.....	12.0	17	80	118	85	33	0.10	0.00
" 27.....	6.9	16	36	86	61	25	0.08	0.03
" 28.....	11.0	17	66	137	82	55	0.22	0.00
" 29.....	14.0	16	80	148	93	55	0.30	0.14
" 30.....	12.0	16	74	182	118	64	0.12	0.04
Average..	11.5	16	66	113	80	33	0.14	0.10

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Putrescibility	Depth of Filter	Size of Filtering Material
	Parts per Million											
Sept. 2.....	0.69	2.6	7.0	2.00	3.60	22	13	11	2	+	7′	1½″–2″
" 3.....	0.69	3.6	8.4	1.50	1.20	23	19	16	3	+	..	....
" 4.....	0.69	1.8	9.4	2.20	2.90	20	9	9	0	+	..	....
" 5.....	0.69	2.4	8.0	1.80	4.40	21	10	9	1	+	..	....
" 6.....	0.69	1.9	7.7	2.40	7.70	14	7	7	9	+	..	....
" 7.....	0.69	1.8	7.0	1.80	5.60	17	7	6	1	+	..	....
" 8.....	0.69	2.2	7.0	1.40	5.30	21	13	11	2	+	..	....
" 9.....	0.69	1.4	7.0	1.60	6.00	20	9	9	0	+	..	....
" 10.....	0.69	3.3	6.7	1.80	1.40	27	17	17	0	+	..	....
" 14.....	0.69	2.3	7.7	1.20	6.90	23	20	19	1	+	..	....
" 15.....	0.69	1.4	7.4	1.20	5.20	19	12	10	2	+	..	....
" 16.....	0.69	1.8	9.0	1.40	4.80	20	13	9	4	+	..	....
" 21.....	0.69	1.8	7.0	1.60	5.70	21	12	12	0	+	..	....
" 22.....	0.69	2.7	5.0	1.80	4.60	24	11	10	1	+	..	....
" 23.....	0.69	1.7	6.4	2.00	4.60	22	27	24	3	+	..	....
" 24.....	0.69	1.1	7.0	2.20	5.50	23	11	9	2	+	..	....
" 25.....	0.69	1.5	7.4	2.20	6.10	24	14	11	3	+	..	....
" 26.....	0.69	2.4	7.7	2.40	5.40	24	13	13	0	+	..	....
" 27.....	0.69	1.7	8.0	2.20	5.70	17	15	12	3	+	..	....
" 28.....	0.69	1.4	6.7	2.20	6.30	22	23	15	8	+	..	....
" 29.....	0.69	2.2	6.7	1.60	5.00	24	17	11	6	+	..	....
" 30.....	0.69	1.9	7.0	1.20	5.00	24	16	13	3	+	..	....
Average....	....	2.0	7.3	1.8	5.0	21	14	12	2		..	....

Influent

1909 Date	Parts per Million										
	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Oct. 1.....	57	53	13.0	14	82	125	81	44	0.08	0.00	0.00
" 4.....	58	52	12.0	13	47	156	102	54	0.70	0.24	0.00
" 5.....	57	53	15.0	15	80	172	118	54	0.08	0.21	0.00
" 6.....	57	54	13.0	14	61	130	86	44	0.90	0.20	0.00
" 7.....	58	53	14.0	16	71	112	76	36	0.80	0.16	0.00
" 9.....	58	56	12.0	16	68	102	70	32	0.40	0.02	0.00
" 10.....	57	54	16.0	14	70	118	80	38	0.22	0.12	0.00
" 11.....	56	56	8.5	14	45	126	62	64	0.04	0.22	0.00
" 13.....	56	54	16.0	14	84	232	142	90	0.07	3.32	0.00
" 14.....	56	47	17.0	14	75	160	94	66	0.18	0.01	0.00
" 15.....	57	53	14.0	13	67	99	69	30	0.07	0.17	0.00
" 16.....	57	55	15.0	14	74	144	90	54	0.07	0.22	0.00
" 19.....	57	56	15.0	16	78	142	98	44	0.11	0.20	0.00
" 20.....	55	52	15.0	17	78	63	47	16	0.12	0.14	0.00
" 21.....	55	48	12.0	16	72	126	78	48	0.20	0.20	0.00
" 22.....	55	49	14.0	18	87	296	186	110	0.10	0.27	0.00
" 23.....	55	51	19.0	15	88	228	140	88	0.12	0.02	0.00
" 25.....	57	59	5.1	16	51	90	66	24	0.01	0.15	0.00
" 26.....	57	58	11.0	15	75	136	90	46	0.12	0.28	0.00
" 27.....	57	58	9.7	16	69	118	82	36	0.12	0.10	0.00
" 28.....	56	56	12.0	13	69	130	84	46	0.10	0.30	0.00
" 29.....	56	56	11.0	14	66	96	68	28	0.14	0.15	0.00
" 30.....	54	53	12.0	17	78	196	130	60	0.08	0.29	0.00
" 31.....	53	47	11.0	16	66	112	98	14	0.08	0.21	0.00
Average....	56	53	13.	15	71	142	93	49	0.21	0.30	0.00

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
Oct. 1.....	.69	1.3	6.0	1.6	4.8	24	22	10	12	5.1	+	7′	1½″–2″
" 4.....	.69	1.8	4.7	2.0	5.3	18	14	12	2	7.5	+	..	....
" 5.....	.69	3.0	4.7	1.6	6.5	21	24	17	7	6.2	+	..	....
" 6.....	.69	3.0	5.0	1.8	5.5	25	18	15	3	6.3	+	..	....
" 7.....	.69	1.9	7.0	1.8	6.5	20	12	10	2	5.5	+	..	....
" 9.....	.69	1.7	8.0	2.0	7.5	22	9	8	1	8.3	+	..	....
" 10.....	.69	1.7	8.0	1.6	6.7	26	17	12	5	6.9	+	..	....
" 11.....	.69	1.6	3.7	2.0	5.7	12	13	1	12	7.8	+	..	....
" 13.....	.69	1.6	5.3	1.2	6.9	20	37	22	15	7.7	+	..	....
" 14.....	.69	2.4	4.4	1.4	5.9	17	10	5	5	7.6	+	..	....
" 15.....	.69	1.9	5.0	1.6	5.0	17	10	6	4	6.5	+	..	....
" 16.....	.69	1.5	5.0	1.6	5.9	17	14	7	7	9.3	+	..	....
" 19.....	.69	3.2	5.7	2.0	7.3	19	15	11	4	6.6	+	..	....
" 20.....	.69	3.0	6.3	1.4	5.7	18	19	11	8	5.7	+	..	....
" 21.....	.69	3.9	5.0	1.0	5.4	21	14	7	7	6.1	+	..	....
" 22.....	.69	1.5	7.0	1.4	4.8	17	11	7	4	5.7	+	..	....
" 23.....	1.00	2.7	7.0	1.6	3.6	16	16	12	4	4.9	+	..	....
" 25.....	1.00	1.5	7.0	2.0	4.4	14	20	9	11	4.5	+	..	....
" 26.....	1.00	1.4	6.3	1.8	3.8	16	4	4	0	3.5	+	..	....
" 27.....	1.00	1.3	6.0	1.6	4.6	15	8	8	0	3.5	+	..	....
" 28.....	1.0	1.3	6.0	1.8	4.0	18	8	5	3	4.8	+	..	....
" 29.....	1.0	1.0	6.7	1.4	4.2	17	4	4	0	3.8	+	..	....
" 30.....	1.0	2.5	6.0	1.2	3.6	19	12	12	0	3.3	+	..	....
" 31.....	1.0	1.5	9.4	1.2	4.0	19	16	12	4	3.7	+	..	....
Average.	...	2.0	6.1	1.6	5.3	19	15	10	5	5.9		..	....

Influent

1908 Date	Parts per Million: Temperature Deg. F. Influent	Temperature Deg. F. Effluent	Nitrogen: Organic	Nitrogen: Free Ammonia	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Nitrites	Nitrates	Oxygen Dissolved	Chlorine.	Alkalinity
Nov. 1.....	51	44	8.3	16	50	112	76	36	.08	0.18	0.00	53	228
" 2.....	51	43	13.0	15	74	156	86	70	.08	0.29	0.00	116	260
" 4.....	52	46	17.0	14	67	112	76	36	.70	0.40	0.20	142	272
" 5.....	52	48	18.0	18	80	130	86	44	.70	0.23	0.00	166	244
" 6.....	51	48	16.0	13	72	120	80	40	.50	0.43	0.00	174	252
" 7.....	52	48	17.0	13	64	98	72	26	.50	0.43	0.53	146	240
" 8.....	51	50	8.8	15	43	98	76	22	.10	0.16	1.70	71	206
" 9.....	51	50	14.0	15	67	90	68	22	.00	0.27	0.67	154	272
" 10.....	52	50	14.0	15	68	112	82	30	.50	0.12	1.60	170	268
" 12.....	51	53	15.0	16	71	122	90	32	.45	0.37	1.20	140	272
" 13.....	52	51	12.0	22	65	108	82	26	.25	0.47	0.76	136	272
" 14.....	52	50	15.0	16	72	108	80	28	.10	0.37	0.26	144	256
" 15.....	50	50	9.7	15	48	104	84	20	.04	0.20	0.00	52	218
" 16.....	50	48	18.0	12	70	114	92	22	.25	1.00	0.80	136	276
" 17.....	50	49	15.0	14	72	118	92	26	.40	0.60	2.30	162	216
" 19.....	50	48	14.0	15	73	152	98	54	.40	0.37	1.10	134	260
" 20.....	51	50	13.0	16	69	110	68	42	.50	0.32	0.46	154	240
" 21.....	50	49	16.0	15	58	92	92	00	.35	0.32	0.33	128	236
" 23.....	52	49	13.0	15	66	138	104	34	.05	0.47	1.10	128	508
" 24.....	51	49	15.0	17	73	130	94	36	.08	0.29	0.99	156	556
" 26.....	51	50	10.0	15	41	226	194	32	.20	0.17	0.60	89	254
" 27.....	51	51	15.0	18	76	144	112	32	.35	0.52	0.18	186	536
" 28.....	51	51	15.0	17	73	110	62	48	.24	0.58	0.60	166	424
" 29.....	50	50	7.4	17	41	102	66	36	.18	0.82	0.59	65	416
" 30.....	50	49	18.0	14	79	190	100	90	.35	1.10	1.90	184	396
Average....	51	49	13.9	15.5	65	124	89	35	.318	0.42	0.71	134	303

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen. Organic	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
	Parts per Million												
Nov. 1.....	1.00	1.4	9.0	1.2	4.6	15	14	12	2	5.8	+	7′	1½′′–2′′
" 2.....	1.00	1.8	8.7	1.2	3.8	22	13	7	6	6.7	+	..	....
" 4.....	1.00	7.1	9.0	1.1	4.7	31	59	43	16	5.6	–	..	....
" 5.....	1.00	5.3	12.0	1.0	3.0	33	53	37	16	5.1	–	..	....
" 6.....	1.00	7.0	7.7	1.0	3.0	30	30	28	2	4.2	–	..	....
" 7.....	1.00	2.9	9.0	1.0	3.2	22	18	14	4	5.7	–	..	....
" 8.....	1.00	2.5	7.4	1.1	3.9	15	17	17	0	5.8	+	..	....
" 9.....	1.00	4.1	8.6	1.6	2.8	22	24	19	5	5.5		..	....
" 10.....	1.00	3.6	8.7	1.0	2.8	21	29	27	2	6.0	+	..	....
" 12.....	1.00	5.9	10.0	0.9	4.9	27	51	44	7	4.5	+	..	....
" 13.....	1.00	5.3	9.0	0.8	4.0	26	27	23	4	5.9	–	..	....
" 14.....	1.00	4.1	9.0	0.7	2.9	24	20	18	2	4.6	–	..	....
" 15.....	1.00	2.8	8.7	0.7	3.9	16	30	30	0	5.4	+	..	....
" 16.....	1.00	5.2	9.4	1.3	2.3	25	25	23	2	4.6	–	..	....
" 17.....	1.00	5.0	8.0	1.0	2.6	23	19	17	2	4.2	–	..	....
" 19.....	1.00	7.7	9.7	0.7	3.3	34	60	46	14	4.2	–	..	....
" 20.....	1.00	4.2	10.0	0.6	3.3	28	26	19	7	4.2	–	..	....
" 21.....	1.00	4.0	9.0	0.6	3.3	22	22	22	0	4.9	–	..	....
" 23.....	1.00	3.1	8.7	0.7	3.6	23	21	17	4	5.6	+	..	....
" 24.....	1.00	6.2	10.0	1.0	1.7	29	141	31	110	4.5	+	..	....
" 26.....	1.00	1.0	12.0	0.8	3.5	17	12	12	0	3.5	+	..	....
" 27.....	1.00	6.0	11.0	0.8	2.3	27	49	45	4	4.4	+	..	....
" 28....	1.00	4.2	12.0	0.5	3.0	27	31	20	11	4.4	–	..	....
" 29.....	1.00	1.7	9.7	0.5	4.0	16	17	17	0	6.0	+	..	....
" 30.....	1.00	7.8	12.0	0.9	1.7	34	61	41	20	4.3	–	..	....
Average.	....	4.4	9.5	0.9	3.3	24	35	25	10	5.0		..	....

Influent

1908 Date	Parts per Million: Temp. Deg. F. Influent	Effluent	Nitrogen: Organic	Nitrogen: Free Ammonia	Oxygen Consumed	Suspended Matter: Total	Volatile	Fixed	Nitrites	Nitrates	Oxygen Consumed
Dec. 1.....	50	50	18	14.0	72	140	98	42	0.30	1.30	3.2
" 5.....	50	48	15	11.0	60	184	67	117	0.30	0.90	2.6
" 7.....	48	46	14	8.7	46	62	53	9	0.20	1.30	6.0
" 8.....	48	46	15	9.4	58	53	42	11	0.25	1.55	4.5
" 10.....	48	46	13	12.0	58	79	61	18	0.40	0.60	5.3
" 12.....	48	46	12	12.0	59	59	43	16	0.35	2.55	2.7
" 14.....	47	47	10	14.0	57	68	54	14	0.40	0.40	1.0
" 16.....	48	47	17	14.0	55	79	61	18	0.70	0.50	2.0
" 18.....	48	46	13	16.0	53	...	..	...	0.20	....	1.4
" 20.....	47	46	10	15.0	32	58	52	6	0.10	0.30	5.9
" 22.....	48	46	14	14.0	56	63	51	12	0.40	0.30	3.1
" 23.....	47	46	11	13.0	53	78	64	14	0.25	0.65	3.2
" 27.....	46	46	12	17.0	32	68	65	3	0.10	0.40	5.4
" 29.....	48	46	16	13.0	69	86	80	6	1.60	0.00	2.5
" 31.....	47	46	19	13.0	67	83	67	16	0.25	1.45	2.2
Average.	48	47	14	13.0	55	83	61	22	0.38	0.87	3.4

Effluent

1909 Date	Daily Yield in Million Gallons Million Gallons	Parts per Million: Nitrogen. Organic	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Suspended Matter: Total	Volatile	Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
Dec. 1.....	1.06	6.8	11.0	1.0	1.4	29	49	39	10	7.9	4.3	−	7′	1½″–2″
" 5.....	1.06	14.0	11.0	1.1	2.8	57	92	70	22	11.0	4.9	−	..	....
" 7.....	1.06	6.4	9.4	0.6	2.8	29	50	44	6	7.6	7.4	+	..	....
" 8.....	1.06	8.0	9.4	0.7	2.8	31	51	42	9	8.6	8.0	−	..	....
" 10.....	1.06	11.0	7.0	1.1	2.0	33	62	50	12	8.3	6.6	+	..	....
" 12.....	1.06	7.4	10.0	0.6	2.5	33	62	49	13	7.8	6.7	−	..	....
" 14.....	1.06	6.5	9.7	0.7	1.1	28	62	47	15	7.5	7.0	+	..	....
" 16.....	1.06	7.1	10.0	0.7	3.2	30	56	48	8	6.9	6.1	+	..	....
" 18.....	1.06	12.0	11.0	0.9	...	37	..	..	..	9.7	5.8	+	..	....
" 20.....	1.06	5.5	10.0	0.8	3.3	19	54	40	14	4.1	7.7	+	..	....
" 22.....	1.06	5.7	11.0	0.7	2.6	29	63	48	15	6.9	7.3	+	..	....
" 23.....	1.06	5.5	10.0	0.9	2.4	28	52	39	13	6.8	6.7	+	..	....
" 27.....	1.06	3.3	11.0	1.2	3.5	14	33	32	1	3.8	7.0	+	..	....
" 29.....	1.06	4.7	12.0	0.9	3.3	33	56	50	6	7.4	6.5	+	..	....
" 31.....	1.06	8.3	12.0	1.2	3.6	30	56	50	6	8.6	5.8	−	..	....
Average..		7.5	9.7	0.87	2.7	31	57	46	11	7.5	6.5		..	....

Influent

1909 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Jan. 3.....	46	44	13	17.0	44	73	68	5	0.88	0.27	4.9
" 7.....	45	44	15	9.2	60	70	54	16	0.23	1.95	2.7
" 11.....	46	44	11	15.0	60	77	62	15	0.63	0.52	4.2
" 15.....	48	46	20	12.0	77	93	77	16	0.40	0.95	2.4
" 19.....	46	44	17	13.0	71	96	72	24	0.25	1.00	0.9
" 23.....	48	46	23	11.0	80	145	82	63	0.28	1.10	1.6
" 27.....	46	46	17	8.3	76	78	52	26	0.30	1.60	2.8
Average....	46	45	17	12.	67	90	67	23	.42	1.06	2 8

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed					
Jan. 3.....	1.06	3.3	11.0	1.1	2.6	17	33	33	0	5.0	7.9	–	7'	1½''–2''
" 7.....	1.06	4.2	9.4	1.6	2.0	27	30	26	4	5.7	6.3	–	..	....
" 11.....	1.06	5.2	12.0	1.6	2.6	27	54	25	29	5.1	7.0	–	..	....
" 15.....	1.06	7.0	11.0	1.1	1.9	37	47	41	6	9.8	6.4	*	..	....
" 19.....	1.06	11.0	12.0	1.6	1.8	37	56	46	10	9.9	4.2	–	..	....
" 23.....	1.06	8.0	14.0	1.8	2.2	47	68	56	12	14.0	3.6	–	..	....
" 27.....	1.06	7.2	10.0	1.6	1.8	36	42	31	11	11.0	4.0	–	..	....
Average..	....	6.6	11.3	1.5	2.1	33	47	37	10	8.6	5.6		..	....

*Stable on the 14th and putrescible on 15th.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Feb. 2.....	46	45	18.0	11.0	73	92	73	19	0.85	0.45	1.50
" 7.....	45	44	15.0	12.0	52	81	66	15	0.55	1.20	4.40
" 11.....	46	44	20.0	10.0	74	116	75	41	0.58	1.10	2.30
" 15.....	45	44	17.0	10.0	60	90	69	21	0.20	1.60	4.80
" 19.....	46	44	17.0	10.0	62	82	62	20	0.20	1.70	3.60
" 28.....	44	43	11.0	8.7	50	56	48	8	0.40	3.10	6.40
Average..	45	44	16.	10.3	62	86	66	20	.46	1.5	3.8

Effluent.

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Susp'ed Matter Total	Susp'ed Matter Fixed	Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
						Parts per Million								
Feb. 2.....	1.06	9.4	12.0	0.70	1.20	46	55	45	10	14.0	4.3	–	7′	1½″–2″
" 7.....	1.06	6.5	12.0	0.60	2.20	34	46	40	6	8.7	5.7	*	..	....
" 11.....	1.06	11.0	12.0	0.70	1.90	45	56	50	6	11.0	3.6	–	..	....
" 15.....	1.06	6.8	12.0	0.90	2.90	33	37	21	16	8.1	5.4	–	..	....
" 19.....	1.06	5.8	11.0	1.00	0.50	34	51	43	8	9.8	5.3	–	..	....
" 28.....	1.06	3.1	7.3	1.10	3.30	21	32	29	3	4.7	7.3	*	..	....
Average..	....	7.1	11.	.83	2.0	36	46	38	8	9.4	5.3		..	....

*Stable on 7th, putrescible on 6th.

*Stable on 28th and putrescible on 27th.

Influent

	Parts per Million										
1909 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Mar. 4.....	45	44	17	11	60	98	88	10	1.10	0.90	3.6
" 8.....	44	43	15	11	60	86	64	22	0.35	1.75	5.3
" 12.....	45	44	18	10	61	96	74	22	0.30	1.30	3.8
" 16.....	44	43	16	10	57	104	90	14	0.90	1.30	3.6
" 20.....	45	43	15	11	55	94	74	20	0.25	1.95	4.3
" 24.....	42	42	13	9	52	80	58	22	0.20	2.30	3.7
" 28.....	43	43	12	9	38	64	42	22	0.40	2.20	4.1
Average....	44	43	15	10	55	89	70	19	.50	1.7	4.1

Effluent

	Parts per Million													
1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed					
Mar. 4.....	1.06	7.4	11.0	1.6	0.4	33	30	30	00	9.0	5.4	–	7′	1½″–2″
" 8.....	1.06	6.0	12.0	1.2	2.5	28	33	32	1	7.6	5.4	*	..	....
" 12.....	1.06	6.4	12.0	0.9	0.9	34	36	31	5	9.9	5.1	–	..	....
" 16.....	1.06	7.6	10.0	0.9	0.6	32	48	44	4	8.7	5.5	–	..	....
" 20.....	1.06	7.2	12.0	1.0	2.8	37	86	65	21	8.9	6.0	–	..	....
" 24.....	1.06	4.2	9.0	0.8	2.9	31	42	33	9	7.8	6.3	–	..	....
" 28.....	1.06	4.1	7.7	0.9	3.6	22	32	24	8	5.1	6.2	+	..	....
Average....	....	6.1	10.5	1.0	2.0	31	44	37	7	8.1	5.7		..	....

*Stable on 7th, putrescible on 8th.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Apr. 1.....	43	43	15.0	7.0	45	86	58	28	0.25	2.60	4.0
" 5.....	43	42	9.2	8.0	43	72	56	16	0.50	2.30	6.8
" 9.....	44	44	9.0	9.0	56	76	54	22	1.80	0.60	4.1
" 17.....	46	46	9.4	14.0	44	72	58	14	2.40	0.00	4.1
" 21.....	47	48	20.0	10.0	58	108	62	46	0.80	2.00	2.9
" 25.....	46	46	12.0	9.7	48	74	56	18	0.30	2.10	7.3
" 29.....	47	45	19.0	11.0	57	80	58	22	0.35	2.10	4.7
Average....	45	45	13.	9.8	50	81	57	24	0.91	1.7	4.8

Note—Each sample covers 48 hours.

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
						Parts per Million								
Apr. 1.....	1.06	3.6	7.0	0.9	3.1	26	32	31	1	6.1	6.2	*	7'	1½''-2''
" 5.....	1.06	4.5	5.3	1.1	3.9	22	40	35	5	4.6	6.6	–	..	....
" 9.....	1.06	4.3	6.3	1.6	2.4	22	39	31	8	3.9	7.1	+	..	....
" 17.....	1.06	4.0	8.4	1.4	3.7	21	41	32	9	3.6	6.7	+	..	....
" 21.....	1.06	6.5	8.7	1.6	2.2	26	56	38	18	6.0	5.3	+	..	....
" 25.....	1.06	2.5	8.7	1.0	3.2	26	41	30	11	4.8	7.8	+	..	....
" 29.....	1.06	8.4	10.0	1.2	2.7	31	71	54	17	7.5	5.8	*	..	....
Average..	....	4.8	7.8	1.2	3.0	25	46	36	10	5.2	6.5		..	....

*Stable on 31st March and unstable April 1st.

*Stable on 28th April and unstable April 29th.

Note—Each sample covers 48 hours.

Influent

1909 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
May 3.....	47	44	12	10.0	40	88	66	22	0.50	0.9	3.1
" 7.....	50	52	22	11.0	57	116	70	46	1.20	0.8	3.8
" 11.....	52	54	16	10.0	57	124	58	66	0.30	2.0	2.4
" 15.....	53	57	23	12.0	59	122	88	34	2.00	0.1	3.2
" 19.....	52	54	21	11.0	62	108	76	32	0.40	2.2	2.3
" 23.....	52	52	17	13.0	45	98	82	16	0.40	0.2	3.0
" 27.....	55	55	19	12.0	64	140	92	48	0.35	1.3	0.63
Average....	52	53	19	11.	55	114	76	38	0.74	1.1	2.6

Effluent

1909 Date	Nitrogen				Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Suspended Matter			Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
	Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed				
May 3.....	6.1	6.7	1.2	3.1	24	4.4	76	54	22	7.3	+	7′	1½′′-2′′
" 7.....	14.0	7.7	1.6	1.2	42	9.4	152	109	43	4.5	–	..	....
" 11.....	20.0	8.7	2.0	2.3	52	12.0	258	170	88	3.3	–	..	....
" 15.....	22.0	9.4	1.6	0.4	64	19.0	456	180	276	3.7	–	..	....
" 19.....	16.0	9.4	1.8	2.6	56	15.0	226	156	70	5.1	–	..	....
" 23.....	9.9	9.0	1.4	3.4	36	7.6	136	100	36	5.8	–	..	....
" 27.....	12.0	9.4	1.4	1.5	42	10.0	108	84	24	3.9	–	..	....
Average....	14.	8.6	1.6	2.1	45	11.	202	122	80	4.8		..	....

– on the 3rd.
+ on the 2nd.
Putrescibility test—48 hrs. at 100 degrees F.

Influent

1909 Date.	Parts per Million: Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
June 3.....	57	58	24	15	64	122	90	32	0.45	0.95	1.1
" 7.....	57	58	15	14	51	82	62	20	0.35	0.55	0.7
" 11.....	57	58	22	12	64	134	80	54	0.60	0.70	0.4
" 15.....	57	60	15	16	54	92	62	30	0.80	0.00	1.3
" 19.....	56	56	15	18	56	92	70	22	0.00	0.20	0.6
" 24.....	62	67	17	19	58	94	78	16	0.05	0.45	0.0
" 28.....	61	65	16	16	39	48	46	2	0.04	0.36	0.0
Average..	58	60	17	16	55	95	70	25	0.33	0.46	0.6

Effluent

1909 Date	Parts per Million: Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
June 3.....	1.06	12.0	10.0	1.8	2.2	48	148	106	42	12.0	5.7	+	7′	1½′′-2′′
" 7.....	1.06	8.9	8.0	2.2	4.9	35	96	66	30	6.2	4.1	-	..	....
" 11.....	1.06	7.1	9.0	2.2	1.3	38	82	58	24	6.3	3.4	+	..	....
" 15.....	1.06	6.0	7.7	1.8	3.2	29	82	48	34	4.8	5.0	+	..	....
" 19.....	1.06	5.8	7.7	1.8	4.6	26	58	40	18	5.3	5.2	+	..	....
" 24.....	1.06	6.4	7.0	1.8	3.0	30	71	55	16	7.1	3.9	+	..	....
" 28.....	1.06	5.0	6.0	1.8	6.2	23	62	41	21	3.9	5.5	+	..	....
Average..	....	7.3	7.9	1.9	3.6	33	86	59	27	6.5	4.7		..	....

Putrescible on the 2nd and stable on the 3rd.
Putrescible on the 10th and stable on the 11th.

Appendix K.

Results of Chemical Analyses of Influent and Effluent of Sprinkling Filter No. 3.

Influent.

1908 Date	Nitrogen: Organic	Nitrogen: Free Ammonia	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Nitrites	Nitrates
	Parts per Million							
Aug. 29.....	11.0	14	52	84	63	21	0.12	0.00
" 30.....	6.2	14	36	67	49	18	0.24	0.03
" 31.....	15.0	15	62	105	81	24	0.20	0.07
Average..	11.	14	50	85	64	21	0.19	0.03
Sept. 1.....	11.0	16	62	103	80	23	0.24	0.18
" 2.....	11.0	16	62	86	61	25	0.16	0.26
" 3.....	11.0	15	62	93	70	23	0.12	0.15
" 4.....	9.8	15	56	88	66	22	0.14	0.18
" 5.....	10.0	14	55	103	70	33	0.08	0.29
" 6.....	6.0	14	33	82	60	22	0.12	0.15
" 7.....	7.8	15	38	73	59	14	0.02	0.05
" 8.....	14.0	16	65	106	78	28	0.10	0.02
" 9.....	12.0	17	65	87	65	22	0.18	0.06
" 10.....	10.0	16	76	145	105	40	0.30	0.02
" 14.....	14.0	17	66	112	88	24	0.10	0.17
" 15.....	12.0	17	64	98	67	31	0.11	0.00
" 16.....	10.0	18	68	106	75	31	0.09	0.00
" 19.....	12.0	18	68	118	78	40	0.07	0.04
" 21.....	16.0	17	77	131	99	32	0.12	0.07
" 22.....	13.0	18	81	132	92	40	0.12	0.02
" 23.....	12.0	17	78	110	79	31	0.11	0.03
" 24.....	15.0	15	82	102	74	28	0.20	1.40
" 25.....	14.0	17	87	156	106	50	0.18	0.01
" 29.....	14.0	16	80	148	93	55	0.30	0.14
" 30.....	12.0	16	74	182	118	64	0.12	0.04
Average..	12.0	16	67	112	80	32	0.14	0.16

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Putrescibility	Depth of Filter	Size of Filtering Material
Aug. 29.....	0.60	7.1	11.0	0.16	0.46	26	30	25	5		5'	1½''–2''
" 30.....	0.60	2.4	12.0	0.60	0.65	19	22	20	2		..	....
" 31.....	0.60	7.5	11.0	0.60	0.43	29	30	26	4		..	....
Average..	0.60	5.7	11.0	.45	.51	25	27	24	3		..	....
Sept. 1.....	0.60	4.5	14.0	0.80	0.43	28	29	26	3		..	....
" 2.....	0.60	5.6	12.0	0.80	0.74	28	27	23	4		..	....
" 3.....	0.60	3.8	11.0	1.10	0.10	27	23	23	0		..	....
" 4.....	0.60	3.6	12.0	1.20	0.00	25	24	24	0		..	....
" 5.....	0.60	4.8	10.0	1.60	0.50	27	23	21	2	+	..	....
" 6.....	0.60	2.2	11.0	1.40	2.00	16	15	14	1	+	..	....
" 7.....	0.60	2.0	10.0	1.50	1.70	18	19	16	3	+	..	....
" 8.....	0.60	2.8	12.0	1.40	1.70	28	22	20	2	+	..	....
" 9....	0.60	2.0	14.0	1.60	1.30	20	19	17	2	−	..	....
" 10.....	0.60	4.6	9.4	2.20	0.60	29	23	19	4	−	..	....
" 14.....	0.60	7.0	9.4	2.00	2.00	28	21	20	1	+	..	....
" 15.....	0.60	4.0	12.0	1.00	2.20	24	10	10	0	+	..	....
" 16.....	0.60	3.6	14.0	1.00	0.50	34	29	24	5	−	..	....
" 19.....	0.60	6.0	14.0	1.60	3.00	34	31	18	13	−	..	....
" 21.....	0.60	2.4	12.0	1.40	2.60	27	20	19	1	+	..	....
" 22.....	0.60	3.1	11.0	1.80	1.40	29	22	19	3	−	..	....
" 23.....	0.60	3.9	11.0	2.40	1.20	28	27	24	3	−	..	....
" 24.....	0.60	2.3	11.0	2.00	2.40	30	20	13	7	−	..	....
" 25.....	0.60	4.3	11.0	2.00	1.80	30	34	27	7	−	..	....
" 29.....	0.60	19.0	14.0	6.00	0.80	70	198	118	80	−	..	....
" 30.....	0.60	10.0	10.0	2.20	1.20	54	96	62	34	−	..	....
Average..	....	4.8	12.0	1.8	1.3	30	35	27	8		..	....

Influent

1908 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
	Parts per Million										
Oct. 1.....	57	53	13.0	14	82	125	81	44	0.08	0.00	0.0
" 2.....	54	50	11.0	14	74	106	70	36	0.32	0.00	0.0
" 8.....	58	56	14.0	14	69	126	86	40	0.90	0.15	0.0
" 9.....	58	57	12.0	16	68	102	70	32	0.40	0.02	0.0
" 10.....	57	56	16.0	14	70	118	80	38	0.22	0.12	0.0
" 11.....	56	55	8.5	14	45	126	62	64	0.04	0.22	0.0
" 13.....	56	53	16.0	14	84	232	142	90	0.07	3.30	0.0
" 14.....	56	50	17.0	14	75	160	94	66	0.18	0.01	0.0
" 17.....	57	55	13.0	16	71	152	100	52	0.10	0.14	0.0
" 18.....	57	57	8.1	17	55	118	78	40	0.07	0.12	0.0
" 19.....	57	55	15.0	16	78	142	98	44	0.11	0.20	0.0
" 20.....	55	50	15.0	17	78	63	47	16	0.12	0.14	0.0
" 21.....	55	48	12.0	16	72	126	78	48	0.20	0.20	0.0
" 22.....	55	50	14.0	18	87	296	186	110	0.10	0.27	0.0
" 25.....	57	57	5.1	16	51	90	66	24	0.01	0.15	0.0
" 26.....	57	58	11.0	15	75	136	90	46	0.12	0.28	0.0
" 27.....	57	58	9.7	16	69	118	82	36	0.12	0.10	0.0
" 28.....	56	56	12.0	13	69	130	84	46	0.10	0.30	0.0
" 29.....	56	55	11.0	14	66	96	68	28	0.14	0.15	0.0
" 30.....	54	51	12.0	17	78	196	130	60	0.08	0.29	0.0
Average..	56	54	12.2	15	71	138	90	48	0.17	0.31	0.0

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
Oct. 1.....	0.6	5.9	9.4	1.80	2.40	44	53	35	18	5.6	−	5′	1½″–2″
" 2.....	0.6	6.4	2.9	1.80	2.20	36	56	36	20	...	−	..	....
" 8.....	0.6	5.9	9.0	2.20	2.00	28	26	24	2	5.8	+	..	....
" 9.....	0.6	3.1	11.0	1.60	3.40	27	13	11	2	6.5	−	..	....
" 10.....	0.6	3.1	9.0	1.00	2.40	24	25	20	5	5.7	−	..	....
" 11.....	0.6	1.5	9.4	1.20	3.60	16	18	6	12	7.1	+	..	....
" 13.....	0.6	4.3	9.0	1.00	2.80	26	28	..	..	7.0	−	..	....
" 14.....	0.6	5.6	9.7	1.40	1.60	27	21	13	8	5.2	−	..	....
" 17.....	0.6	3.3	14.0	1.80	3.40	29	28	20	8	6.8	−	..	....
" 18.....	0.6	2.8	9.7	2.00	2.60	15	14	10	4	9.4	+	..	....
" 19.....	0.6	5.6	9.7	1.20	2.80	24	16	16	0	4.8	−	..	....
" 20.....	0.6	4.1	12.0	1.40	1.80	25	20	11	9	3.3	−	..	....
" 21.....	0.6	5.9	11.0	1.60	1.00	27	24	18	6	3.5	−	..	....
" 22.....	0.6	5.1	9.4	1.20	1.80	24	25	15	10	5.8	−	..	....
" 25.....	1.0	3.1	13.0	1.80	1.00	19	42	33	9	4.0	−	..	....
" 26.....	1.0	5.3	10.0	1.60	1.00	27	36	30	6	4.0	−	..	....
" 27.....	1.0	5.0	11.0	1.40	1.00	25	39	32	7	4.5	−	..	....
" 28.....	1.0	4.9	9.0	1.40	1.80	26	26	21	5	5.3	−	..	....
" 29.....	1.0	3.9	11.0	1.20	1.40	25	18	14	4	4.3	−	..	....
" 30.....	1.0	5.1	11.0	1.00	0.50	29	32	25	7	4.3	−	..	....
Average..	...	4.5	10.0	1.5	2.0	26	28	21	7	5.4		..	....

Influent

1908 Date	Parts per Million										
	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Nov. 1.....	51	42	8.3	16	50	112	76	36	.05	0.18	0.00
" 2.....	51	41	13.0	15	74	156	86	70	.08	0.29	0.00
" 3....	52	47	9.9	16	59	144	104	40	.07	0.33	0.00
" 4.....	52	49	17.0	14	67	112	76	36	.70	0.40	0.20
" 5.....	52	46	18.0	18	80	130	86	44	.70	0.23	0.00
" 6.....	51	46	16.0	13	72	120	80	40	.50	0.43	0.00
" 8.....	51	48	8.8	15	43	98	76	22	.10	0.16	1.70
" 9.....	51	49	14.0	15	67	90	68	22	.60	0.27	0.67
" 10.....	52	50	14.0	15	68	112	82	30	.50	0.12	1.60
" 11.....	52	52	14.0	15	66	134	92	42	.55	0.38	0.86
" 12.....	51	51	15.0	16	71	122	90	32	.45	0.37	1.20
" 13.....	52	50	12.0	22	65	108	82	26	.25	0.47	0.76
" 15.....	50	49	9.7	15	48	108	84	24	.04	0.20	0.00
" 16.....	50	48	18.0	12	70	114	92	22	.25	1.00	0.80
" 17.....	50	49	15.0	14	72	118	92	26	.40	0.60	2.30
" 18.....	50	48	15.0	15	68	140	88	52	.30	0.37	1.10
" 19.....	50	49	14.0	15	73	152	98	54	.40	0.37	1.10
" 20.....	51	50	13.0	16	69	110	68	42	.50	0.32	0.46
" 23.....	52	49	13.0	15	66	138	104	34	.05	0.47	1.10
" 24.....	51	50	15.0	17	73	130	94	36	.08	0.29	0.99
" 26.....	51	52	10.0	15	41	262	194	68	.20	0.17	0.60
" 27.....	51	50	15.0	18	76	144	112	32	.35	0.52	0.18
" 29.....	50	50	7.4	17	41	102	66	36	.18	0.82	0.59
" 30.....	50	49	18.0	14	79	190	100	90	.35	1.10	1.90
Average...	51	49	13.5	16	65	131	91	40	.32	0.41	0.75

Effluent.

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Suspended Matter Total	Volatile	Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
Nov. 1	1	4.7	13	0.6	2.60	24	37	28	9	12.0	+	5′	1½″–2″
" 2	1	7.3	10	0.9	2.90	32	38	28	10	7.6	–	..	....
" 3	1	4.1	12	1.0	1.80	25	50	32	18	6.4	–	..	....
" 4	1	7.7	12	1.0	2.20	31	38	35	3	5.4	–	..	....
" 5	1	6.5	16	2.0	0.00	35	46	34	12	4.0	–	..	....
" 6	1	8.7	12	1.2	0.70	34	32	30	2	4.1	–	..	....
" 8	1	3.5	12	1.2	2.60	20	28	28	0	6.1	+	..	....
" 9	1	4.9	13	1.4	0.70	26	33	20	13	4.3	+	..	....
" 10	1	4.1	13	0.8	2.00	27	12	12	0	4.5	–	..	....
" 11	1	6.5	13	1.2	0.70	32	41	29	12	3.3	–	..	....
" 12	1	6.7	12	0.9	1.40	27	24	22	2	3.4	–	..	....
" 13	1	2.3	12	0.8	1.20	27	25	23	2	3.4	–	..	....
" 15	1	4.3	12	0.8	3.20	20	28	26	2	5.7	+	..	....
" 16	1	6.6	12	1.4	1.30	28	37	35	2	4.0	–	..	....
" 17	1	7.4	10	1.2	1.40	30	25	25	0	3.2	–	..	....
" 18	1	4.6	12	0.6	0.40	29	31	22	9	2.5	–	..	....
" 19	1	4.2	12	0.8	1.00	28	28	23	5	3.3	–	..	....
" 20	1	5.2	15	0.8	0.90	24	20	16	4	2.6	–	..	....
" 23	1	5.4	12	1.2	1.00	29	37	30	7	6.7	–	..	....
" 24	1	6.8	13	1.2	0.30	33	35	25	10	3.2		..	....
" 26	1	2.2	14	0.7	1.70	18	22	22	0	2.3	–	..	....
" 27	1	7.8	14	1.2	1.20	29	30	30	0	2.4	–	..	....
" 29	1	3.2	13	0.7	2.40	18	28	24	4	4.9	–	..	....
" 30	1	11.0	14	1.2	1.20	41	46	32	14	3.2	–	..	....
Average	.	5.7	13	1.0	1.45	28	32	26	6	4.5		..	....

16

Influent

1908 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates
	Parts per Million									
Dec. 2.....	50	48	18.0	13.0	71	146	100	46	0.55	0.55
" 5.....	49	44	15.0	11.0	60	184	67	117	0.30	0.90
" 7.....	48	45	14.0	8.7	46	62	53	9	0.20	1.30
" 9.....	48	46	14.0	11.0	59	61	47	14	1.00	0.40
" 11.....	48	44	9.8	13.0	58	69	56	13	0.70	0.10
" 13.....	47	44	7.4	13.0	34	56	47	9	0.60	0.50
" 15.....	48	46	12.0	14.0	54	88	70	18	0.40	0.30
" 17.....	48	46	12.0	16.0	52	70	54	16	0.40	....
" 19.....	48	45	16.0	16.0	51	94	69	25	0.20	....
" 21.....	47	45	12.0	16.0	56	76	67	9	0.10	0.60
" 26.....	47	45	14.0	15.0	47	64	58	6	0.50	0.40
" 28.....	47	45	14.0	15.0	58	68	65	3	0.45	0.35
" 30.....	47	45	16.0	14.0	63	82	70	12	0.30	0.40
Average..	48	45	13.	13.5	55	86	63	23	0.44	0.53

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
		Parts per Million												
Dec. 2.....	1	14.0	11.0	0.8	0.60	40	43	36	7	11.0	2.7	–	5′	1½″–2″
" 5.....	1	16.0	11.0	0.9	2.10	41	57	37	20	12.0	4.5	–	..	....
" 7.....	1	5.2	11.0	0.8	2.40	26	29	29	0	7.7	7.0	+	..	....
" 9.....	1	4.2	12.0	1.1	1.40	27	24	19	5	9.0	4.8	+	..	....
" 11.....	1	5.2	9.4	0.6	1.30	26	28	24	4	8.1	4.6	+	..	....
" 13.....	1	4.4	11.0	0.8	2.80	18	26	24	2	4.4	6.2	+	..	....
" 15.....	1	9.4	12.0	0.9	1.70	24	21	21	0	7.1	5.0	+	..	....
" 17.....	1	6.1	13.0	1.2	....	25	27	20	7	7.1	3.7	+	..	....
" 19.....	1	6.1	11.0	1.2	....	20	9	9	0	6.9	3.6	–	..	....
" 21.....	1	4.3	14.0	1.3	2.40	25	32	28	4	9.6	6.2	+	..	....
" 26.....	1	5.7	15.0	1.4	2.20	21	19	19	1	5.8	5.1	+	..	....
" 28.....	1	7.7	15.0	2.0	1.80	26	31	30	1	7.9	6.4	+	..	....
" 30.....	1	5.7	13.0	1.4	2.60	26	27	27	0	9.6	5.5	+	..	....
Average....	.	7.2	12.	1.1	1.9	27	29	25	4	8.2	5.0		..	....

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Jan. 5.....	46	45	16	10.0	60	70	58	12	0.32	1.08	4.6
" 9.....	46	43	18	12.0	66	91	76	15	0.25	1.20	3.4
" 13.....	46	44	15	14.0	67	76	56	20	0.80	0.36	2.7
" 17.....	46	44	15	15.0	72	88	71	17	0.30	0.61	3.0
" 21.....	47	44	22	10.0	78	108	81	27	0.27	1.05	2.1
" 25.....	45	44	13	9.4	58	73	55	18	0.28	1.60	4.1
" 31.....	45	44	14	14.0	54	83	65	18	0.57	0.50	4.8
Average....	46	44	16	12.	65	84	66	18	.40	.91	3.5

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
						Parts per Million						
Jan. 5.....	1.0	7.6	10.0	1.6	1.1	25	30	28	2	7.4	6.3	+
" 9.....	1.0	4.8	14.0	1.4	1.7	29	34	29	5	7.5	5.6	*
" 13.....	1.0	4.8	14.0	1.2	2.4	34	39	26	13	9.2	5.1	*
" 17.....	1.0	6.2	14.0	1.2	1.2	29	60	49	11	9.2	4.8	*
" 21.....	1.0	7.0	14.0	1.2	1.7	34	35	31	4	11.0	4.8	−
" 25.....	1.0	3.6	10.0	1.2	2.6	26	31	26	5	6.0	4.5	+
" 31.....	1.0	7.6	12.0	1.2	2.4	30	32	20	12	7.6	5.3	*
Average....	...	5.9	13.	1.3	1.9	30	37	30	7	8.3	5.2	

*Stable on the 8th and putrescible on the 9th.
Stable on the 12th and putrescible on the 13th.
Stable on the 16th and putrescible on the 17th.
Putrescible on the 30th and stable on 31st.

Influent

1909 Date	Parts per Million										
	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Feb. 5.....	46	44	19.0	11.0	77	103	76	27	0.38	0.98	0.98
" 9.....	46	43	20.0	10.0	78	95	74	21	0.48	1.70	3.01
" 13.....	46	44	19.0	11.0	76	96	86	10	0.28	1.30	2.40
" 17.....	45	43	15.0	9.2	65	66	49	17	0.20	2.00	4.20
" 21.....	41	41	6.8	6.0	26	70	62	8	0.15	2.40	8.20
Average....	45	43	16.	9.4	64	86	69	17	.30	1.7	3.8

Effluent

1909 Date	Parts per Million											
	Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Suspended Matter			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed			
Feb. 5.....	1.0	8.5	14.0	0.80	0.90	51	83	64	19	16.0	2.9	-
" 9.....	1.0	13.0	16.0	1.80	0.70	39	56	45	11	12.0	3.6	-
" 13.....	1.0	6.2	15.0	0.80	1.60	36	44	33	11	10.0	4.6	-
" 17.....	1.0	9.0	12.0	1.10	1.60	47	86	72	14	11.0	5.6	-
" 21.....	1.0	1.7	6.7	0.80	3.10	15	42	38	4	4.7	7.3	+
Average....	...	7.7	13.	1.06	1.6	38	62	50	12	11.	4.8	

Influent

1909 Date.	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
Mch. 2.....	44	43	16.0	8.7	66	84	66	18	0.20	1.40	3.6
" 6.....	44	43	16.0	14.0	64	88	66	22	0.25	1.45	4.1
" 10.....	45	43	22.0	11.0	60	86	64	22	0.35	1.75	5.3
" 14.....	44	40	12.0	12.0	50	82	50	32	0.25	1.95	5.4
" 18.....	45	44	17.0	10.0	58	98	64	34	0.35	1.75	3.9
" 22.....	44	41	13.0	12.0	52	80	56	24	0.20	1.90	5.4
" 26.....	43	43	9.2	12.0	48	74	62	12	0.80	1.80	4.6
" 30.....	43	42	15.0	8.4	58	126	78	48	0.90	2.60	4.6
Average....	44	42	15.	11.0	57	90	63	27	.41	1.8	4.6

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Suspended Matter.			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed			
Mch. 2.....	1.0	6.0	10	1.2	0.4	34	58	42	16	9.0	6.1	−
" 6.....	1.0	6.0	14	1.2	0.6	33	53	40	13	9.6	6.0	−
" 10.....	1.0	8.4	14	1.2	0.3	29	47	33	14	9.8	4.8	−
" 14.....	1.0	4.0	13	1.0	2.2	25	34	21	13	5.6	6.4	*
" 18.....	1.0	7.8	13	1.1	2.6	33	32	24	8	7.1	6.3	−
" 22.....	1.0	6.0	14	1.0	2.6	28	49	37	12	6.3	6.5	+
" 26.....	1.0	2.8	11	1.0	1.8	24	26	23	3	6.5	6.4	+
" 30.....	1.0	4.6	10	1.6	1.7	27	50	40	10	6.7	6.6	+
Average....	...	5.7	12	1.2	1.5	29	44	33	11	7.6	6.1	

*Putrescible on 13th, stable on 14th.

Influent.

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter. Total	Suspended Matter. Volatile	Suspended Matter. Fixed	Nitrites	Nitrates	Oxygen Dissolved	Chlorine	Alkalinity
April 3.....	43	44	8.0	10.0	47	78	60	18	1.10	0.00	3.1	88	200
" 7.....	44	46	7.4	9.0	38	58	44	14	1.00	1.10	4.5	84	167
" 11.....	44	41	10.0	9.7	40	72	64	8	1.30	1.10	6.0	72	192
" 15.....	47	45	12.0	6.4	41	74	56	18	1.60	1.10	4.7	102	172
" 19.....	45	48	15.0	10.0	47	74	60	14	0.20	2.90	2.9	96	188
" 23.....	47	47	17.0	11.0	58	138	52	86	0.45	2.15	3.2	136	200
" 27.....	48	47	19.0	11.0	59	106	74	32	0.25	2.35	4.3	180	216
Average.	45	45	13.	9.6	47	86	59	27	0.84	1.5	4.1	108	191

Parts per Million

Each sample covers 48 hours.

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia.	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
April 3.....	1.0	3.7	9.7	1.2	2.2	22	23	21	2	5.3	4.4	+
" 7.....	1.0	4.3	8.7	1.6	2.0	21	39	33	6	3.8	7.4	+
" 11.....	1.0	2.8	9.4	1.6	2.0	19	27	24	3	3.9	8.2	+
" 15.....	1.0	3.0	6.7	1.6	2.3	20	23	20	3	3.5	7.2	+
" 19.....	1.0	3.9	9.7	1.6	2.6	17	17	17	0	3.9	5.0	+
" 23.....	1.0	5.6	12.0	1.6	2.2	30	16	16	0	6.0	4.9	+
" 27.....	1.0	8.6	11.0	1.6	1.6	26	27	22	5	6.3	6.1	+
Average..	...	4.5	9.6	1.5	2.1	22	25	22	3	4.7	6.2	

Parts per Million

Each sample covers 48 hours.

Influent

1909 Date	Parts per Million										
	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
May 1.....	46	44	11	11.0	47	104	60	44	1.70	0.7	4.2
" 5.....	49	48	20	9.4	56	84	60	24	0.40	1.8	1.7
" 9.....	52	55	15	11.0	40	86	74	12	0.80	1.4	3.3
" 13.....	52	53	20	10.0	59	118	74	44	0.25	2.3	2.5
" 17.....	52	54	15	11.0	57	92	54	38	0.60	2.0	2.5
" 21.....	53	54	22	9.0	71	164	96	68	1.40	0.4	1.9
" 25.....	54	54	20	13.0	62	112	80	32	0.30	1.6	0.6
" 28.....	56	58	20	11.0	59	120	70	50	0.35	1.4	2.1
Average....	52	53	18	10.7	56	110	71	39	0.73	1.5	2.4

Effluent

1909 Date	Parts per Million											
	Daily Yield in Million Gallons Per Acre	Nitrogen				Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Suspended Matter			Oxygen Dissolved	Putrescibility
		Organic	Free Ammonia	Nitrites	Nitrates			Total	Volatile	Fixed		
May 1.....	1.0	3.7	9.7	1.4	1.6	29	3.5	14	14		[illegible]	—
" 5.....	1.0	8.2	11.0	1.8	2.2	26	6.8	42	33	9	5.8	—
" 9.....	1.0	6.6	9.0	2.2	1.2	23	6.0	55	46	9	5.5	—
" 13.....	1.0	9.6	10.0	2.4	1.2	34	9.0	92	67	25	4.5	—
" 17.....	1.0	6.3	7.7	2.0	2.8	19	3.3	31	21	10	5.7	—
" 21.....	1.0	7.5	9.0	2.4	0.0	30	7.4	61	28	33	5.4	—
" 25.....	1.0	6.5	10.0	2.0	1.3	31	5.8	51	38	13	3.8	—
" 28.....	1.0	11.0	9.0	1.8	1.3	36	6.3	90	64	26	4.2	—
Average....	...	7.4	9.4	2.0	1.5	27	6.0	55	39	16	5.1	

— on the 4th. — on the 17th.
+ on the 5th. + on the 20th.
+ on the 16th. — on the 22nd.

Influent

1909 Date	Parts per Million: Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
June 1.....	55	55	23	14	65	140	110	30	0.50	0.80	1.7
" 5.....	56	57	19	18	64	166	104	62	0.00	0.10	0.9
" 9.....	56	56	21	17	66	132	100	32	0.35	0.45	0.4
" 13.....	58	57	12	16	44	104	70	34	0.05	0.15	1.5
" 17.....	57	58	13	18	54	82	62	20	0.20	0.30	1.4
" 22.....	69	61	16	17	58	104	78	26	0.10	0.20	0.0
" 26.....	62	61	15	18	55	94	78	16	0.03	0.28	0.0
" 30.....	62	61	13	23	58	116	96	20	0.02	0.25	0.0
Average...	58	58	17	18	58	117	87	30	0.16	0.31	0.7

Effluent

1909 Date	Parts per Million: Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility
June 1.....	1.0	10.0	11.0	1.2	0.0	32	52	45	7	8.1	3.1	
" 5.....	1.0	5.3	12.0	0.8	0.4	28	45	35	10	7.2	2.5	+
" 9.....	1.0	8.9	14.0	0.8	0.0	37	76	70	6	10.7	1.9	−
" 13.....	1.0	5.7	9.0	1.6	1.8	25	44	36	8	4.3	4.8	−+
" 17.....	1.0	7.0	12.0	1.4	1.0	33	60	48	12	8.2	3.0	−+
" 22.....	1.0	13.0	8.4	2.2	0.2	44	152	106	46	10.6	4.4	+
" 26.....	1.0	6.8	11.0	1.3	0.4	30	42	32	10	6.6	1.5	+
" 30.....	1.0	3.8	12.0	1.2	0.3	26	24	24	0	6.3	1.8	−
Average..	...	7.6	11.	1.3	0.5	32	62	50	12	7.7	2.9	

Stable on the 4th and putrescible on the 5th.
Stable on the 13th and putrescible on the 12th.
Stable on the 17th and putrescible on the 16th.
Stable on the 21st and putrescible on the 22nd.

Appendix L.

Results of Chemical Analyses of Influent and Effluent of Sprinkling Filter No. 4.

Influent

1908 Date	Parts per Million							
	Nitrogen.		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates
	Organic	Free Ammonia		Total	Volatile	Fixed		
Aug. 28.....	12.0	14.0	49	73	58	15	0.04	0.38
" 29.....	12.0	14.0	50	62	51	11	0.12	0.05
" 30.....	5.6	13.0	32	47	42	5	0.12	0.05
" 31.....	11.0	15.0	58	94	73	21	0.18	0.09
Average..	10.0	14.0	47	69	56	13	0.12	0.14
Sept. 1.....	9.0	16.0	59	83	66	17	0.18	0.24
" 2.....	8.6	17.0	58	80	59	21	0.07	0.20
" 4.....	8.8	12.0	50	81	69	12	0.15	0.12
" 5.....	9.4	13.0	52	77	63	14	0.10	0.27
" 6.....	3.8	15.0	32	64	52	12	0.10	0.02
" 7.....	7.2	14.0	37	57	49	8	0.01	0.00
" 8.....	10.0	14.0	59	107	84	23	0.07	0.01
" 11.....	13.0	15.0	79	98	76	22	0.08	0.09
" 12.....	8.8	16.0	60	83	62	21	0.04	0.08
" 13.....	9.2	14.0	47	81	65	16	0.06	0.01
" 15.....	11.0	15.0	57	64	52	12	0.08	0.00
" 16.....	8.4	17.0	64	74	54	20	0.06	0.00
" 17.....	13.0	16.0	59	80	62	18	0.07	0.01
" 18.....	6.4	16.0	71	89	71	18	0.03	0.19
" 21.....	13.0	17.0	70	83	69	14	0.10	0.00
" 22.....	7.6	15.0	67	77	62	15	0.09	0.00
" 23.....	6.8	19.0	69	67	54	13	0.11	0.00
" 24.....	13.0	16.0	70	68	53	15	0.06	0.05
" 25.....	13.0	16.0	74	86	66	20	0.04	0.00
" 27.....	8.9	14.0	33	52	44	8	0.12	0.00
" 28.....	11.0	17.0	59	89	61	28	0.02	0.00
Average....	9.5	15.0	58	78	62	16	0.08	0.06

Effluent.

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen. Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Suspended Matter: Total	Volatile	Fixed	Putrescibility	Depth of Filter	Size of Filtering Material
Aug. 28.....	0.64	7.9	11.0	0.50	0.12	38	33	28	5		5′	1½″–2″
" 29.....	0.64	5.1	11.0	1.00	0.33	37	29	24	5		..	....
" 30.....	0.64	2.1	12.0	0.80	0.44	19	14	12	2		..	....
" 31.....	0.64	6.3	11.0	1.30	0.54	25	22	20	2		..	....
Average..	....	5.3	11.0	0.91	0.36	30	25	21	4		..	....
Sept. 1.....	0.64	3.3	14.0	0.90	0.43	25	22	19	3		..	....
" 2.....	0.64	5.8	11.0	1.60	0.85	25	32	29	3	.	..	....
" 4.....	0.64	2.6	11.0	1.20	1.20	23	22	20	2	.	..	....
" 5.....	0.64	3.4	9.0	1.60	1.00	23	15	15	0	+	..	....
" 6.....	0.64	1.0	9.4	1.60	2.30	14	12	12	0	+	..	....
" 7.....	0.64	4.0	12.0	1.40	2.00	17	13	12	1	+	..	....
" 8.....	0.64	2.0	10.0	1.40	2.50	21	18	15	3	+	..	....
" 11.....	0.64	3.0	9.4	1.00	2.40	28	20	18	2	−	..	....
" 12.....	0.64	2.6	9.4	1.00	2.40	25	15	12	3	+	..	....
" 13.....	0.64	1.6	8.4	1.60	3.80	18	10	8	2	+	..	....
" 15.....	0.64	1.5	9.7	1.60	3.40	20	3	3	0	+	..	....
" 16.....	0.64	1.6	10.0	1.20	4.20	21	14	10	4	−	..	....
" 17....	0.64	1.8	9.0	2.20	1.80	24	19	17	2	+	..	....
" 18.....	0.64	4.6	9.4	2.00	3.00	24	13	10	3	.	..	....
" 21.....	0.64	3.1	9.7	1.80	3.4	27	18	15	3	+	..	....
" 22.....	0.64	3.4	8.7	1.40	3.8	32	28	28	0	+	..	....
" 23.....	0.64	3.2	9.7	2.00	2.2	29	21	20	1	+	..	....
" 24.....	0.64	3.1	9.4	1.80	2.2	28	15	11	4	+	..	....
" 25.....	0.64	3.9	11.0	1.40	2.6	29	22	20	2	+	..	....
" 27.....	0.64	1.9	11.0	1.60	3.6	17	12	12	0	+	..	....
" 28.....	0.64	2.5	10.0	1.40	4.0	21	16	12	4	+	..	....
Average..	....	2.8	9.6	1.5	2.5	23	17	15	2		..	....

Influent

1908 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Oct. 1.....	57	53	8.4	15.0	69	35.5	24.0	11.5	0.18	0.00	0.00
" 2.....	53	50	12.0	14.0	63	65.0	55.0	10.0	0.16	0.00	0.00
" 4.....	57	53	11.0	14.0	40	56.0	45.0	11.0	0.03	0.09	0.00
" 5.....	57	53	12.0	14.0	63	86.0	67.0	19.0	0.12	0.04	0.00
" 6.....	57	54	12.0	13.0	57	63.0	50.0	13.0	0.09	0.07	0.00
" 13.....	55	52	11.0	12.0	58	69.0	49.0	20.0	0.55	0.25	0.00
" 14.....	56	51	13.0	14.0	60	86.0	57.0	29.0	0.10	0.14	0.00
" 15.....	57	53	13.0	14.0	65	77.0	59.0	18.0	0.10	0.09	0.00
" 16.....	58	57	14.0	13.0	66	79.0	59.0	20.0	0.16	0.15	0.00
" 17.....	58	57	12.0	14.0	61	67.0	52.0	15.0	0.28	0.00	0.00
" 22.....	54	49	12.0	19.0	70	86.0	64.0	22.0	0.14	0.28	0.00
" 23.....	55	50	7.0	15.0	61	82.0	64.0	18.0	0.12	0.01	0.00
" 25.....	57	59	12.0	13.0	37	58.0	50.0	8.0	0.02	0.09	0.00
" 26.....	57	58	9.3	16.0	64	95.0	69.0	26.0	0.24	0.13	0.00
" 27.....	57	58	12.0	12.0	62	59.0	57.0	2.0	0.20	0.00	0.00
" 28.....	56	56	12.0	12.0	65	89.0	61.0	28.0	0.10	0.32	0.00
" 29.....	56	55	11.0	12.0	60	61.0	48.0	13.0	0.20	0.17	0.00
" 30.....	54	50	12.0	14.0	62	83.0	64.0	19.0	0.12	0.25	0.00
Average.	56	54	11.0	14.0	60	72.	55.	17.	0.16	0.12	0.00

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen: Organic	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
	Parts per Million												
Oct. 1.....	.64	4.8	9.7	2.2	3.0	32	25	18	7	4.9	−	5′	1½″–2″
" 2.....	.64	3.3	8.0	1.2	3.4	30	17	14	3	4.6	+	..	....
" 4.....	.64	2.7	9.4	1.2	3.8	14	13	11	2	6.0	+	..	....
" 5.....	.64	3.7	8.4	1.2	3.0	24	19	15	4	5.2	+	..	....
" 6.....	.64	3.9	9.0	2.0	1.0	24	17	14	3	4.5	−	..	....
" 13.....	.64	2.9	10.0	1.3	11.0	27	32	25	7	8.6	−	..	....
" 14.....	.64	5.7	6.4	2.0	2.2	28	24	18	6	6.2	−	..	....
" 15.....	.64	2.3	9.0	2.0	2.0	23	19	15	4	4.3	−	..	....
" 16.....	.64	3.3	8.0	1.2	1.6	24	21	15	6	5.1	+	..	....
" 17.....	.64	2.6	8.7	1.2	2.6	23	16	12	4	6.0	−	..	....
" 22.....	.64	11.0	12.0	4.0	3.5	44	70	49	21	5.9	−	..	....
" 23.....	1.20	7.4	8.7	4.4	0.0	31	36	28	8	5.2	−	..	....
" 25.....	1.20	1.3	8.0	1.8	2.0	15	8	8	0	4.5	+	..	....
" 26.....	1.20	2.2	8.7	1.6	2.6	19	7	7	0	4.1	+	..	....
" 27.....	1.20	4.9	10.0	1.6	1.2	26	22	21	1	5.0	+	..	....
" 28.....	1.20	5.5	9.0	1.8	0.3	30	42	32	10	4.8	−	..	....
" 29.....	1.20	3.3	8.0	1.2	2.8	24	14	14	0	5.3	+	..	....
" 30.....	1.20	5.4	8.7	0.8	2.8	25	14	11	3	4.2	+	..	....
Average.	....	4.2	8.9	1.8	2.7	26	23	18	5	5.2		..	....

Influent

1908 Date	Parts per Million													
	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved	Chlorine	Alkalinity
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed					
Nov. 1.....	51	38	6.1	15	37	49	36	13	0.14	.10	0.00	53	190
" 2.....	51	39	11.0	13	61	64	46	18	0.08	.21	0.32	104	256
" 3.....	53	45	9.3	15	47	86	66	20	0.14	.17	0.00	112	220
" 4.....	52	45	14.0	14	56	64	50	14	0.70	.20	0.00	134	244
" 5.....	50	40	14.0	17	68	70	55	15	0.70	.75	0.00	148	216
" 6.....	50	39	17.0	11	66	76	54	22	1.00	.00	0.00	166	244
" 8.....	50	43	7.2	15	31	55	47	8	0.12	.14	2.00	64	176
" 9.....	48	44	13.0	16	60	71	53	18	0.10	.22	0.16	154	248
" 10.....	49	50	13.0	15	60	71	55	16	0.40	.17	0.24	170	288
" 11.....	51	49	11.0	13	50	54	37	17	1.20	.10	0.00	144	232
" 12.....	49	45	13.0	16	63	76	57	19	0.50	.12	0.00	142	232
" 13.....	49	39	14.0	14	57	76	64	12	0.20	.22	0.00	144	224
" 15.....	49	36	9.0	16	33	50	48	2	0.10	.14	0.00	61	184
" 16.....	48	40	13.0	15	58	57	44	13	0.15	.22	0.00	130	256
" 17.....	49	40	14.0	16	58	80	64	16	0.24	.58	0.40	166	252
" 18.....	47	42	14.0	14	59	74	56	18	0.10	.27	0.08	150	240
" 19.....	48	44	13.0	14	61	79	57	22	0.10	.32	0.00	138	232
" 20.....	51	45	13.0	15	58	77	55	22	0.15	.27	0.00	152	236
" 23.....	50	45	12.0	14	60	86	72	14	0.60	.40	1.90	112	424
" 24.....	44	48	14.0	14	64	70	68	2	0.45	.48	2 90	148	372
" 26.....	51	50	8.6	15	37	70	59	11	0.60	.19	0.26	92	188
" 27.....	51	45	15.0	18	67	130	98	32	0.60	.00	0.59	176	420
" 29.....	50	41	7.4	17	32	58	50	8	0.16	.51	3.20	70	352
" 30.....	50	45	18.0	14	68	114	67	47	0.60	.60	0.20	176	416
Average..	50	43	12.0	15	55	74	57	17	0.38	.27	0.51	129	264

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Suspended Matter: Total	Volatile	Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Material Size of Filtering
Nov. 1.....	1.0	10.0	13	0.4	2.6	62	98	58	40	62	5.8	-	5′	1½″-2″
" 2.....	1.0	5.1	11	0.8	2.6	31	60	37	23	31	7.1	+	..	....
" 3.....	1.0	5.5	9	1.1	2.5	29	56	36	20	29	7.3	+	..	....
" 4.....	1.0	7.5	11	0.8	2.2	32	46	39	7	32	6.7	–	..	....
" 5.....	1.0	7.1	15	0.5	2.1	37	44	31	13	37	5.9	–	..	....
" 6.....	1.0	6.9	11	0.8	1.3	34	36	26	10	34	5.7	–	..	....
" 8.....	1.0	3.9	10	1.0	2.2	19	31	29	2	19	7.0	+	..	....
" 9.....	1.0	5.5	12	2.0	0.0	27	46	32	14	27	6.2	–	..	....
" 10.....	1.0	5.3	10	0.7	2.1	28	30	30	0	28	5.2	–	..	....
" 11.....	1.0	4.1	11	0.7	2.3	26	28	24	4	26	4.8	–	..	....
" 12.....	1.0	7.7	12	0.6	2.0	28	25	25	0	28	5.2	–	..	....
" 13.....	1.0	5.5	12	0.4	2.2	29	36	31	5	29	3.7	–	..	....
" 15.....	1.0	3.3	13	0.5	3.5	19	34	31	3	19	7.4	–	..	....
" 16.....	1.0	6.8	11	1.1	1.3	26	33	26	7	26	5.8	–	..	....
" 17.....	1.0	6.4	11	1.0	1.6	29	26	24	2	29	6.1	–	..	....
" 18.....	1.0	5.2	11	1.1	0.3	28	34	23	11	28	4.9	–	..	....
" 19.....	1.0	6.0	11	0.5	1.5	33	54	40	14	33	5.7	–	..	....
" 20.....	1.0	4.8	11	0.6	1.5	26	24	22	2	26	4.1	–	..	....
" 23.....	1.0	5.8	10	0.7	1.6	25	32	25	7	25	6.5	.	..	....
" 24.....	1.0	5.2	11	0.7	1.8	27	26	23	3	27	5.8	–	..	....
" 26.....	1.0	2.4	11	0.8	2.8	18	29	23	6	18	4.0	+	..	....
" 27.....	1.0	4.4	13	0.8	2.6	26	28	24	4	26	6.3	+	..	....
" 29.....	1.0	2.2	12	0.6	2.9	19	27	21	6	19	8.5	.	..	....
" 30.....	1.0	8.8	13	0.8	1.9	37	40	25	15	37	5.4	–	..	....
Average..	...	5.6	11	0.8	2.0	29	38	29	9	29	5.9		..	....

Influent

1908 Date	Temp. Deg. F.		Nitrogen		Oxygen Consumed	Suspended Matter			Nitrites	Nitrates	Oxygen Dissolved
	Influent	Effluent	Organic	Free Ammonia		Total	Volatile	Fixed			
					Parts per Million						
Dec. 2.....	50	36	14.0	11.0	64	67	51	16	0.40	0.90	3.6
" 3.....	49	37	16.0	12.0	65	88	68	20	0.40	0.60	3.6
" 4.....	49	40	17.0	11.0	63	88	66	22	0.40	0.90	2.6
" 7.....	48	44	14.0	12.0	56	90	75	15	0.45	0.75	2.6
" 9.....	48	40	15.0	13.0	62	79	61	18	0.70	0.10	5.2
" 11.....	48	41	11.0	13.0	58	82	64	18	0.80	0.00	2.5
" 13.....	47	38	7.6	12.0	33	61	53	8	0.70	0.20	4.1
" 15.....	49	43	12.0	13.0	53	92	71	21	0.40	0.30	2.3
" 17.....	48	41	16.0	14.0	55	84	60	24	0.40	....	1.5
" 19.....	48	41	17.0	16.0	52	105	84	21	0.15	....	1.9
" 21.....	47	37	16.0	15.0	59	83	67	16	0.40	0.50	2.3
" 26.....	47	38	14.0	17.0	52	77	75	2	0.55	0.45	1.8
" 28.....	48	37	17.0	12.0	61	81	70	11	0.40	1.00	2.7
" 30.....	47	41	16.0	13.0	60	78	65	13	0.20	0.20	2.0
Average....	48	39	15.	13.	57	83	67	16	0.45	0.49	2.8

Effluent

1908 Date	Daily Yield in Million Gallons Per Acre	Nitrogen.				Oxygen Consumed	Suspended Matter			Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
		Organic	Free Ammonia	Nitrites	Nitrates		Total	Volatile	Fixed					
		Parts per Million												
Dec. 2.....	1.20	8.1	12.0	0.4	1.70	35	36	33	3	10.0	8.3	–	5′	1½″–2″
" 3.....	1.20	7.8	14.0	0.6	0.30	55	59	49	10	10.0	6.7	–	..	....
" 4.....	1.20	6.6	12.0	0.5	0.80	31	37	36	1	11.0	6.3	–	..	....
" 7.....	1.20	6.2	12.0	0.5	2.70	28	32	26	6	7.9	5.9	+	..	....
" 9.....	1.20	6.2	12.0	1.0	0.30	27	35	28	7	11.0	6.0	+	..	....
" 11.....	1.20	7.6	11.0	0.5	0.40	36	64	50	14	13.0	5.2	–	..	....
" 13.....	1.20	4.4	11.0	0.5	1.40	18	32	29	3	4.6	7.1	+	..	....
" 15.....	1.20	6.4	11.0	0.6	1.60	31	52	42	10	9.5	4.6	–	..	....
" 17.....	1.20	8.2	12.0	0.8	....	30	36	28	8	9.5	5.0	–	..	....
" 19.....	1.20	9.9	13.0	0.2	....	29	54	42	12	9.7	5.5	–	..	....
" 21.....	1.20	7.5	15.0	0.6	1.20	31	41	36	5	7.6	6.2	–	..	....
" 26.....	1.20	8.4	15.0	0.9	0.80	29	72	63	9	8.6	6.9	–	..	....
" 28.....	1.20	9.5	14.0	0.9	0.80	36	55	50	5	12.0	7.1	–	..	....
" 30.....	1.20	11.0	12.0	0.8	0.90	38	52	52	00	12.0	5.2	–	..	....
Average..	....	7.3	13.	0.63	1.1	32	47	40	7	9.7	6.1		..	....

Influent.

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
Jan. 5.....	47	42	15	10	59	67	57	10	0.32	1.40	3.9
" 9.....	46	40	17	11	64	92	77	15	0.28	1.30	2.4
" 13.....	47	40	17	11	65	78	58	20	0.22	1.30	2.6
" 17.....	46	40	18	14	68	84	69	15	0.55	0.55	3.7
" 21.....	47	42	21	10	79	87	69	18	0.22	0.88	3.0
" 25.....	45	41	14	10	58	72	56	16	0.30	1.20	5.3
" 31.....	46	39	12	14	58	76	56	20	0.85	0.30	4.5
Average....	46	41	16	11	64	79	63	16	0.39	.99	3.6

Effluent.

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen. Organic	Nitrogen. Free Ammonia	Nitrogen. Nitrites	Nitrogen. Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
						Parts per Million								
Jan. 5.....	1.2	9.0	11.0	0.9	1.20	31	40	40	0	10.0	6.4	–	5′	1½′′–2′′
" 9.....	1.2	9.0	13.0	0.7	1.40	36	59	47	12	12.0	5.6	–	..	....
" 13.....	1.2	8.0	15.0	0.6	0.80	42	48	32	16	15.0	5.6	–	..	....
" 17.....	1.2	10.0	16.0	0.2	0.42	42	42	36	6	11.0	5.2	–	..	....
" 21.....	1.2	8.2	15.0	0.8	0.70	42	35	32	3	13.0	5.5	–	..	....
" 25.....	1.2	6.2	11.0	1.1	1.50	32	49	38	11	8.0	5.3	*	..	....
" 31.....	1.2	10.0	11.0	0.7	1.10	37	50	35	15	9.0	6.0	*	..	....
Average....	...	8.6	13.	.7	1.0	37	46	37	9	11.	5.6		..	....

*Stable on the 24th and putrescible on 25th.
Putrescible on the 30th and stable on 31st.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
Feb. 5.....	46	43	18	11.0	76	90	70	20	0.18	1.40	1.70
" 9....	47	41	20	9.0	74	95	71	24	0.15	1.70	2.80
" 13.....	47	42	18	11.0	79	88	77	11	0.25	1.40	3.50
" 17.....	46	40	16	8.7	67	57	52	5	0.30	1.40	4.20
" 21.....	41	38	6	6.0	24	66	66	0	0.25	2.60	8.70
Average..	45	41	16	9.1	64	79	67	12	.23	1.70	4.2

(Parts per Million)

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
Feb. 5.....	1.2	8.7	15.0	.60	0.70	40	71	54	17	15.0	3.7	-	5′	1½″-2″
" 9.....	1.2	8.2	13.0	.70	1.20	42	47	39	8	12.0	3.3	-	..	....
" 13.....	1.2	10.0	14.0	.60	0.90	44	49	36	13	13.0	4.9	-	..	....
" 17.....	1.2	7.2	12.0	.80	0.90	37	35	35	0	11.0	5.6	-	..	....
" 21.....	1.2	5.1	5.7	.80	1.90	18	40	37	3	4.1	8.3	+	..	....
Average....	...	7.8	12.	.70	1.1	36	48	40	8	11.0	5.2		..	....

(Parts per Million)

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
	Parts per Million										
Mch. 2.....	45	40	17	9.3	64	96	72	24	0.20	1.9	4.2
" 6.....	44	38	17	12.0	62	84	58	26	0.20	0.5	3.8
" 10.....	45	41	19	11.0	62	82	58	24	0.90	1.2	3.7
" 14.....	44	40	11	14.0	46	106	68	38	0.35	1.4	4.8
" 18.....	45	37	18	11.0	60	86	62	24	0.40	1.8	4.3
" 22.....	43	38	13	12.0	51	76	52	24	0.15	1.9	5.9
" 26.....	43	39	13	12.0	52	71	60	11	0.30	2.4	4.9
" 30.....	43	40	13	9.0	58	118	80	38	1.00	1.6	5.3
Average....	44	39	15	11.	57	90	64	26	.44	1.6	4.6

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
	Parts per Million													
Mch. 2.....	1.2	7.4	11	0.9	0.6	31	49	35	14	8.7	6.9	–	5′	1½″–2″
" 6.....	1.2	7.0	15	0.8	0.4	38	51	41	10	12.0	6.5	–	..	....
" 10.....	1.2	7.8	15	0.6	0.7	34	50	35	15	10.0	5.3	–	..	....
" 14.....	1.2	5.2	14	0.9	0.8	25	42	27	15	6.8	6.5	–	..	....
" 18.....	1.2	8.6	13	0.8	1.0	36	49	39	10	8.7	6.6	–	..	....
" 22.....	1.2	6.2	13	0.8	2.4	27	40	32	8	6.6	7.7	*	..	....
" 26.....	1.2	5.0	10	0.9	1.2	25	33	27	6	7.8	6.7	–	..	....
" 30.....	1.2	5.0	10	1.6	0.5	30	61	48	13	8.6	6.7	–	..	....
Average..	...	6.5	13	.9	1.0	31	47	36	11	8.6	6.6		..	....

*Stable on 21st and putrescible on 22d.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
					Parts per Million						
April 3.....	43	42	8.3	9.7	48	76	58	18	1.80	0.00	1.6
" 7.....	44	46	7.4	9.0	38	58	44	14	1.00	1.10	4.5
" 11.....	43	39	11.0	9.0	40	72	64	8	1.30	1.30	7.8
" 15.....	45	44	11.0	6.7	43	76	60	16	1.60	0.90	5.4
" 19.....	45	48	14.0	10.0	48	76	62	14	0.20	2.60	3.4
" 23.....	47	47	19.0	9.4	57	102	34	68	0.25	2.30	2.7
" 27.....	46	46	21.0	10.0	62	102	74	28	0.30	2.30	5.7
Average..	45	45	13.	9.1	48	80	56	24	0.92	1.5	4.4

Note—Each sample covers 48 hours.

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
						Parts per Million								
April 3.....	1.2	4.0	9.0	1.4	0.2	23	35	29	6	7.8	5.0	*	5′	1½′′-2′′
" 7.....	1.2	3.9	8.3	1.4	0.6	22	27	25	2	4.5	6.3	–	..	....
" 11.....	1.2	5.8	10.0	1.6	0.6	23	38	34	4	5.6	8.6	*	..	....
" 15.....	1.2	6.2	6.7	1.6	0.8	23	41	32	9	5.0	5.2	*	..	....
" 19.....	1.2	6.4	10.0	1.2	2.1	24	40	37	3	6.0	4.6	–	..	....
" 23.....	1.2	9.0	11.0	1.2	1.7	33	58	45	13	9.6	4.8	–	..	....
" 27.....	1.2	12.0	11.0	1.2	1.5	34	53	41	12	9.5	6.8	–	..	....
Average..	...	6.8	9.4	1.4	1.1	26	42	35	7	6.8	5.9		..	....

*Unstable on 2nd and stable on 3rd.
Unstable on 10th and stable on 11th.
Unstable on 14th and stable on 15th.
Each sample in above table covers 48 hours.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
May 1.....	47	43	12	11.0	50	114	66	48	2.40	0.0	5.6
" 5.....	48	43	21	9.0	58	92	64	28	0.30	2.1	3.0
" 9.....	50	55	14	12.0	44	100	82	18	1.40	0.2	4.2
" 13.....	51	53	21	9.0	57	106	76	30	0.35	2.6	3.5
" 17.....	52	54	10	12.0	41	90	54	36	1.00	1.4	5.2
" 21.....	53	54	18	9.7	58	118	78	40	1.10	1.2	2.2
" 25.....	54	54	18	13.0	62	102	74	28	1.80	0.1	0.48
" 28.....	56	58	21	11.0	48	112	66	46	1.80	1.4	1.8
Average.	51	52	17	11.	52	104	70	34	1.3	1.1	3.3

Parts per Million

Effluent

1909 Date	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
May 1.....	7.8	9.0	1.2	0.8	29	6.8	73	54	19	4.5	+	5′	1½″–2″
" 5.....	13.0	11.0	1.8	0.5	39	10.0	109	78	31	4.8	–	..	....
" 9.....	16.0	11.0	1.0	0.7	48	9.0	186	135	51	3.7	–	..	....
" 13.....	23.0	12.0	2.4	0.2	64	19.0	280	190	90	4.0	–	..	....
" 17.....	15.0	9.4	1.8	2.5	52	11.0	206	130	76	5.2	+	..	....
" 21.....	17.0	11.0	2.0	0.8	51	15.0	232	164	68	5.5	–	..	....
" 25.....	16.0	12.0	2.0	1.5	45	12.0	172	110	62	4.5	–	..	....
" 28.....	18.0	11.0	2.0	0.7	53	11.0	254	162	92	4.5	–	..	....
Average..	16.	11.	1.8	1.0	48	12.	189	128	61	4.6		..	....

Parts per Million

– on the 30th April and + May 1st.
+ on the 16th May and – May 17th.

Influent

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Nitrites	Nitrates	Oxygen Dissolved
			Parts per Million								
June 1.....	55	56	16.0	15	59	104	86	18	0.45	0.00	0.9
" 5.....	58	59	20.0	17	53	140	90	50	0.00	0.10	0.3
" 9....	57	58	23.0	16	65	124	98	26	0.55	0.55	0.3
" 13.....	57	58	9.8	14	42	94	62	32	0.05	0.25	1.5
" 17.....	59	60	13.0	18	52	82	62	20	0.05	0.00	1.0
" 22.....	63	64	16.0	17	59	110	84	26	0.10	0.30	0.4
" 26.....	62	63	16.0	17	56	110	86	24	0.03	0.78	0.0
" 30.....	63	64	14.0	20	56	104	86	18	0.06	0.21	0.0
Average..	59	60	16.	17	55	109	82	27	0.16	0.27	0.55

Effluent

1909 Date	Daily Yield in Million Gallons Per Acre	Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Suspended Matter Total	Suspended Matter Volatile	Suspended Matter Fixed	Oxygen Consumed 5 Min. Cold Test	Oxygen Dissolved	Putrescibility	Depth of Filter	Size of Filtering Material
		Parts per Million												
June 1.....	1.2	17.0	13.0	3.2	0.0	55	234	170	64	14.0	4.6	–	5′	1½″
" 5.....	1.2	10.0	12.0	0.1	0.5	41	102	74	28	9.8	4.1	–	..	....
" 9.....	1.2	15.0	14.0	0.4	0.1	41	96	82	14	11.6	3.4	–	..	....
" 13.....	1.2	7.5	11.0	0.8	1.6	31	100	70	30	7.4	4.1	+	..	....
" 17.....	1.2	11.0	11.0	1.4	0.7	39	110	76	34	8.6	4.6	–	..	....
" 22.....	1.2	10.0	8.0	2.4	0.5	34	104	70	34	8.4	6.1	–	..	....
" 26.....	1.2	5.4	10.0	2.2	0.6	27	58	47	11	7.2	2.9	+	..	....
" 30.....	1.2	4.2	10.0	1.6	0.0	30	47	36	11	6.4	2.7	+	..	....
Average..	...	10.	11.	1.5	0.5	37	106	78	28	9.2	4.1		..	....

Appendix M.

Results of Chemical Analyses of Influent and Effluent of Settling Basin No. 1.

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 2.7 Hours.

1908 Date	INFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter
Sept. 10.....	3.3	6.7	1.80	1.8	27	16	16	2.0	6.4	1.60	3.2	23	12	12
” 11.....	...	...	....	...	28	..	..	2.4	8.4	1.40	4.2	30	15	16
” 12.....	1.2	8.0	0.80	5.6	21	9	10	1.6	8.4	1.00	5.0	20	9	13
” 13.....	2.0	6.0	1.40	6.9	16	6	8	2.2	7.0	1.40	7.1	19	8	8
” 14.....	2.0	6.9	1.10	7.6	20	12	13	2.0	8.0	1.40	6.7	20	11	11
” 15.....	1.3	7.9	1.30	6.2	18	7	8	1.3	8.7	1.20	6.9	18	9	9
” 16.....	1.7	8.0	1.40	6.0	19	7	10	1.3	8.7	1.40	6.3	19	7	10
” 17.....	1.5	5.7	1.40	6.3	17	5	5	1.2	4.4	1.40	7.5	20	10	11
” 18.....	1.6	6.0	1.40	7.9	17	5	7	1.4	7.0	1.60	7.7	22	8	9
” 19.....	1.0	7.4	1.40	6.9	13	5	11	1.2	8.0	1.60	6.5	19	5	10
21.....	1.8	7.0	1.60	5.7	21	12	12	1.6	8.0	2.00	5.1	20	8	9
22.....	2.9	8.0	1.80	4.6	24	10	11	2.1	6.0	1.80	4.2	21	8	8
” 23.....	1.7	6.4	2.00	4.6	22	10	11	1.1	7.0	1.80	6.9	26	9	9
24.....	1.1	7.4	2.20	5.5	23	9	11	1.1	7.0	2.40	5.3	21	7	9
” 25.....	1.5	7.4	2.20	6.1	24	11	14	1.2	7.7	2.40	5.1	23	7	8
” 26.....	2.8	7.7	2.40	7.0	29	22	25	3.7	8.4	2.40	6.1	25	16	19
” 27.....	1.6	6.7	1.90	6.9	16	10	13	1.3	8.0	2.00	5.7	21	9	11
” 28.....	1.4	5.4	1.60	6.6	20	11	19	0.8	6.0	1.80	7.7	19	9	13
” 29.....	1.6	6.4	1.20	6.3	21	9	14	1.5	7.0	1.40	6.3	23	9	13
” 30.....	1.9	6.4	1.00	6.3	22	12	14	2.3	5.4	1.20	5.6	21	9	12
Average..	1.8	6.9	1.6	6.0	21	10	12	1.7	7.3	1.7	6.0	22	9	11

Source of Influent Sprinkling Filter Nos. 1 and 2. Period of Flow Through Settling Basin 2.7 Hours.

1908 Date	Temp. Deg. F.		INFLUENT Parts per Million								EFFLUENT Parts per Million								
			Nitrogen								Nitrogen								
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility
Oct. 1	54	54	1.3	6.0	1.60	4.80	24	22	10	5.1	0.9	6.4	1.60	5.00	21	4	11	4.1	
” 2	53	52	3.7	6.4	1.10	8.40	26	19	27	6.0	2.1	6.4	1.80	6.50	23	14	18	3.0	
” 4	51	51	1.6	5.6	1.70	6.00	16	13	15	7.8	1.0	4.7	1.60	7.30	13	8	8	7.4	
” 5	53	53	3.0	5.1	1.40	6.50	23	17	23	6.5	1.1	7.0	1.40	5.90	24	17	19	6.8	
” 6	54	54	2.9	5.4	1.50	6.60	25	15	19	6.8	3.2	5.7	1.80	5.30	18	15	15	6.4	
7	53	54	1.6	7.5	1.50	7.20	22	12	15	6.3	0.7	8.7	1.40	6.10	19	10	11	6.3	
” 8	55	55	1.9	7.0	1.80	8.30	24	22	28	8.0	2.2	6.7	2.00	6.10	20	16	18	5.0	
” 9	57	56	1.4	8.4	1.80	7.50	23	11	15	7.8	1.0	8.7	2.00	8.30	21	13	19	7.7	
” 10	56	54	1.7	7.0	1.60	7.50	26	14	19	6.8	2.4	5.7	1.60	7.10	37	12	14	7.7	
” 11	56	55	2.6	4.7	2.00	6.80	17	9	27	7.7	2.2	4.3	2.00	7.90	15	3	15	7.0	
” 13	48	54	1.6	5.3	1.20	6.90	20	22	37	7.7	2.9	4.6	1.60	5.50	19	15	17	6.5	
14	50	50	2.4	4.4	1.40	5.90	17	5	10	7.6	2.4	4.1	1.80	5.50	17	7	15	7.1	
” 15	54	54	1.7	5.9	2.00	6.80	20	13	22	7.4	2.9	4.4	2.20	6.10	19	13	20	6.7	
” 16	57	55	1.7	5.0	1.60	7.00	18	10	19	11.0	0.94	6.0	2.00	5.70	18	14	10	8.0	
” 17	57	56	3.1	5.0	1.60	8.10	19	12	21	8.0	1.7	6.0	2.00	6.50	17	6	6	6.9	
” 18	56	57	1.3	4.4	2.20	8.80	11	11	17	9.4	1.6	4.7	2.40	7.60	13	5	8	6.2	
” 19	56	56	2.7	5.2	2.00	9.15	19	12	16	8.2	3.2	5.7	2.20	7.30	16	12	12	6.0	
” 20	51	51	3.1	5.7	1.40	6.90	19	10	16	6.9	1.3	6.4	1.60	6.30	18	7	10	7.3	
” 21	48	48	3.8	4.7	1.30	6.45	23	20	44	6.7	2.9	6.0	1.60	5.50	18	8	17	6.9	
” 22	48	47	1.5	7.0	1.40	4.80	17	7	11	5.7	3.4	4.7	1.60	6.30	16	4	7	8.4	
23	49	48	2.7	7.0	1.60	3.60	16	12	16	7.0	2.8	7.7	....	4.50	20	13	14	4.8	
25	59	59	1.4	6.5	2.10	5.60	15	10	17	5.6	1.0	6.3	2.20	5.70	14	10	10	5.4	
26	58	58	1.5	5.8	1.80	5.70	17	6	6	5.3	1.4	6.3	2.20	4.90	16	7	7	5.6	
27	58	58	1.4	6.4	1.80	5.00	17	10	10	4.9	1.9	7.0	2.20	4.60	16	3	3	5.1	
” 28	56	56	1.9	6.0	1.90	5.00	18	5	7	5.6	1.4	6.7	2.20	4.40	18	6	7	5.9	
” 29	56	56	1.3	6.9	1.50	4.90	18	4	4	6.1	1.7	6.0	2.00	3.20	17	11	11	5.2	
” 30	53	53	1.8	6.2	1.40	4.70	17	8	8	5.4	1.5	7.4	1.60	5.20	17	9	11	5.6	
31	47	57	1.5	9.1	1.10	4.80	20	16	18	4.5	6.6	9.0	1.40	5.00	19	8	11	5.9	
Average	54	54	2.1	6.0	1.61	6.4	20	12	18	6.9	2.1	6.2	1.85	5.9	19	10	12	6.2	

NOTE.—Period of flow through tank 2.7 hours up to Oct. 22nd and 1.5 hours after that date.

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1908 Date	Temp. Deg. F.		INFLUENT Parts per Million								EFFLUENT Parts per Million								
			Nitrogen								Nitrogen								
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility
Nov. 1.....	44	44	1.7	8.4	1.1	4.9	15	10	23	6.4	1.6	7.7	1.8	4.2	14	9	13	7.0	+
" 2.....	42	42	4.3	8.2	1.1	4.2	24	20	41	7.4	1.4	8.7	1.8	4.0	20	5	9	7.5	+
" 4.....	46	48	7.1	9.0	1.3	5.0	31	43	64	6.3	4.4	9.7	1.1	3.9	26	22	27	4.2	+
" 5.....	47	46	4.8	12.0	1.1	3.6	32	32	45	5.9	4.3	11.0	1.2	3.2	28	16	19	5.5	+
" 6.....	47	46	6.1	8.2	1.1	3.9	29	27	30	5.3	3.9	10.0	1.0	3.0	27	16	23	3.0	—
" 7.....	48	48	4.5	8.2	1.1	3.6	22	13	20	5.9	3.9	8.4	1.1	2.7	21	22	25	5.4	+
8.....	50	50	2.5	7.4	1.2	5.0	15	15	15	6.9	1.7	7.4	1.2	4.2	14	..	..	5.4	+
" 9.....	50	49	3.4	8.1	1.5	4.8	22	16	21	5.8	2.0	8.7	1.2	3.0	18	11	21	5.6	+
10.....	50	50	2.9	8.5	1.1	3.9	20	20	21	5.2	1.6	9.1	1.1	3.5	19	13	13	6.0	+
" 12.....	52	50	7.4	4.7	1.1	5.8	28	40	48	5.1	5.9	10.0	1.1	4.1	25	16	16	4.3	+
" 13.....	51	50	4.1	9.6	0.9	5.3	24	20	23	4.6	3.0	9.7	1.1	4.3	23	21	21	3.3	+
" 14.....	50	50	3.5	8.2	0.9	4.3	22	15	16	5.6	1.6	8.7	0.8	7.1	25	14	17	4.6	+
" 15.....	50	50	2.0	7.7	0.9	4.8	15	22	22	5.7	2.9	7.0	0.8	5.0	13	13	13	4.8	+
" 16.....	48	48	3.9	8.6	1.2	4.0	22	19	20	4.9	2.3	8.7	0.9	4.3	23	12	17	4.8	+
" 17.....	49	49	4.1	7.4	1.0	4.1	22	10	11	4.1	4.0	7.4	0.9	3.5	19	9	9	4.2	+
" 19.....	48	48	6.1	8.7	1.0	5.2	29	32	41	4.7	3.8	10.0	0.8	4.1	20	17	17	4.3	+
" 20.....	50	50	3.1	8.7	0.8	4.8	23	14	18	4.6	3.1	8.7	0.8	3.4	21	12	12	4.0	+
" 21.....	49	49	3.2	8.0	0.8	4.8	19	14	14	4.6	2.3	8.7	0.8	4.0	20	7	7	3.0	+
" 23.....	48	48	2.4	7.9	0.9	5.3	20	15	18	6.0	2.1	7.7	0.8	4.3	17	11	11	4.5	+
" 24.....	50	50	4.5	8.5	1.1	3.3	27	23	81	6.0	1.9	8.7	1.0	3.0	25	6	7	4.0	+
" 26.....	52	51	1.3	10.4	1.0	5.6	17	13	13	5.3	1.2	11.0	1.0	5.0	15	17	17	3.9	+
" 27.....	51	51	3.7	11.0	0.9	2.5	25	32	39	4.7	1.8	12.0	1.0	2.9	23	14	14	3.9	+
" 28.....	50	51	3.6	10.0	0.7	4.7	24	15	25	4.7	2.0	11.0	0.8	3.3	23	10	16	3.1	+
" 29.....	50	50	1.8	8.2	0.7	5.7	15	13	15	6.3	1.1	8.7	0.8	4.3	13	12	14	4.1	+
" 30.....	50	49	6.3	10.0	1.0	4.1	28	23	40	4.9	5.0	10.0	0.8	3.1	29	14	28	4.1	+
Average..	49	49	3.9	8.8	1.0	4.5	23	21	29	5.5	2.8	9.1	1.0	3.9	21	13	16	4.6	

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1908 Date	Temp. Deg. F.		INFLUENT Parts per Million									EFFLUENT Parts per Million									
			Nitrogen									Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
Dec. 1	50	50	4.6	8.9	1.00	2.90	26	32	39	4.8	6.4	3.2	9.4	0.70	2.30	21	15	15	3.2	+	5.5
" 5	49	48	11.5	9.3	1.20	4.90	45	56	72	5.4	9.3	10.0	10.0	1.10	6.00	39	46	46	5.3	−	10.6
" 7	46	46	5.0	8.2	0.60	4.40	23	32	35	7.1	6.3	2.8	9.4	0.60	4.30	20	22	22	8.0	+	5.2
" 8	46	46	5.4	8.4	0.65	3.80	26	29	34	7.3	7.4	5.0	8.0	0.60	3.70	23	24	32	6.9	+	7.0
" 10	46	46	7.8	7.4	1.05	3.60	28	34	41	6.9	8.3	4.9	9.7	0.80	3.70	28	37	42	5.4	+	6.8
" 12	46	46	4.7	8.4	0.75	3.40	31	38	47	7.2	6.9	6.8	11.0	0.80	3.10	24	23	39	7.2	+	7.7
" 14	46	46	5.9	8.7	0.85	2.75	24	30	41	6.2	6.3	3.5	8.7	0.80	4.10	22	20	20	6.7	+	5.4
" 16	47	48	5.0	9.5	0.95	3.70	27	38	45	6.3	6.2	5.1	10.0	0.90	3.50	21	23	26	6.2	+	5.9
" 18	46	46	8.0	10.5	1.20	....	24	..	..	6.1	8.3	5.7	13.0	1.10	....	24	..	..	6.3	+	7.0
20	46	46	4.3	9.2	1.10	4.40	17	30	39	8.0	3.5	4.7	10.0	1.10	3.20	13	14	18	7.8	+	2.9
" 22	46	46	4.4	10.5	1.10	3.05	25	39	52	7.4	6.0	2.3	12.0	1.00	2.90	20	20	23	7.9	+	5.7
" 23	46	46	3.3	11.0	1.20	2.25	26	33	42	6.8	6.9	2.5	11.0	1.10	2.10	23	26	29	7.9	+	4.8
" 27	46	46	3.0	10.5	1.70	4.45	14	29	30	7.8	3.8	2.9	11.0	1.60	4.60	14	19	19	6.8	+	3.7
" 29	46	46	5.2	10.5	1.30	3.40	29	44	47	6.8	6.5	2.7	12.0	1.20	3.00	24	22	22	7.3	+	6.2
31	46	46	7.5	10.5	1.70	3.90	30	46	52	6.5	7.4	8.5	11.0	1.10	4.00	27	30	33	6.5	+	7.2
Average	47	47	5.7	9.4	1.1	3.6	26	36	44	6.7	6.6	4.7	10.4	0.97	3.6	23	24	28	6.6		6.1

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F.		INFLUENT										EFFLUENT									
			Parts per Million										Parts per Million									
			Nitrogen										Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
Jan. 1.....	44	44	2.8	12.0	1.7	2.8	16	31	31	8.1	+	4.5	3.1	12.0	1.4	2.4	15	21	21	7.9	+	4.0
	44	44	3.0	9.4	1.6	2.0	26	24	28	6.7	+	5.4	2.6	9.4	1.2	2.7	24	17	20	6.1	+	5.3
	44	44	5.1	12.0	1.6	1.8	25	25	44	7.8	+	5.9	5.8	11.0	1.2	3.4	23	14	23	6.6	+	5.9
	46	46	4.9	12.0	1.5	2.4	34	37	42	7.3	*	8.4	4.0	12.0	1.6	1.9	33	33	34	7.0	+	8.4
	44	44	8.4	12.0	1.6	1.9	38	40	46	6.3	*	9.8	9.0	13.0	1.2	2.2	31	33	35	5.5	+	8.9
	46	46	6.7	13.0	1.8	2.2	38	43	52	4.2	–	11.2	7.6	12.0	1.2	2.1	33	30	31	4.2	+	11.0
	46	46	6.9	9.5	1.6	1.8	35	29	38	5.0	*	10.3	5.6	12.0	1.4	0.7	34	25	31	5.2	+	11.0
Average....	45	45	5.4	11.	1.6	2.1	30	33	40	6.5		7.9	5.4	12.	1.3	2.2	28	25	28	6.1		7.8

*Filter No. 2 putrescible on the 15th.
Filters Nos. 1 and 2 putrescible on 18th and stable on 19th.
Filter No. 1 stable, No. 2 putrescible.

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F.		INFLUENT										EFFLUENT									
			Parts per Million										Parts per Million									
			Nitrogen										Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
Feb. 2.....	46	44	7.2	11.0	1.16	1.60	38	36	44	5.6		12.0	6.0	13.0	1.10	1.60	34	32	40	6.2	*	12.0
" 7.....	45	44	4.7	11.0	1.20	2.30	29	31	35	6.2	†	7.0	3.3	12.0	0.90	3.20	27	24	25	6.6	†	7.8
" 11.....	46	44	8.0	12.0	1.15	2.15	37	39	13	5.0		9.0	7.0	13.0	1.20	2.40	34	33	42	6.2	—	8.8
15.....	45	44	5.5	12.0	1.25	2.80	30	22	30	5.9		6.8	4.2	13.0	1.30	2.30	29	25	27	6.8	*	6.7
" 19.....	46	44	1.8	11.0	1.40	1.10	29	36	40	5.8		7.9	3.4	13.0	1.80	1.80	26	26	30	6.6	*	7.4
" 28.....	44	43	2.8	6.5	1.40	4.0	19	20	29	7.8	†	3.8	2.7	7.3	1.60	5.7	18	21	24	8.4	†	3.1
Average.	45	44	5.5	11.	1.3	2.4	30	32	37	6.1		7.8	4.4	12.	1.3	2.8	28	27	31	6.8		7.6

*Filter No. 1 stable, No. 2 Putrescible
*Stable on 1st and putrescible on 2nd.
Stable on 14th and putrescible on 15th
Stable on 20th and putrescible on 19th.

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen									EFFLUENT Parts per Million Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
Mar. 4.....	44	44	5.2	10.0	1.8	1.2	29	30	30	6.0	6.9	5.6	10	1.6	1.7	28	28	28	6.9	+	6.8
" 8.....	43	43	4.9	12.0	1.5	2.8	28	28	34	6.0	6.8	4.2	11	1.8	2.9	26	28	32	6.8	+	6.6
" 12.....	44	44	5.4	11.0	1.3	1.6	31	29	37	5.7	8.5	6.6	11	1.4	2.0	29	23	28	6.2	−	8.1
" 16.....	43	43	6.1	9.5	1.6	1.6	29	38	40	6.0	6.2	4.8	10	2.4	0.7	25	25	26	6.3	+	4.9
" 20.....	43	43	5.1	12.0	1.4	3.5	32	48	62	7.9	7.4	3.6	12	1.6	3.1	25	31	38	6.9	+	6.3
" 24.....	42	42	7.1	8.5	1.2	3.0	26	26	31	7.1	5.9	4.0	8	1.2	3.0	25	23	29	7.4	+	5.9
" 28.....	43	43	5.9	7.6	1.3	3.6	22	20	27	6.3	4.6	3.6	7	1.4	3.5	22	18	23	7.6	+	3.6
Average....	43	43	5.7	10.1	1.4	2.5	28	31	37	6.4	6.6	4.6	10	1.6	2.4	26	25	29	6.9		6.0

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F.		INFLUENT Parts per Million								EFFLUENT Parts per Million								
			Nitrogen								Nitrogen								
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility
April 1.....	43	42	3.3	6.5	1.3	2.0	24	30	31	6.4	2.9	5.7	1.4	4.3	22	19	19	7.4	+
" 5.....	42	42	1.7	5.1	1.3	1.0	26	61	66	7.4	1.1	6.7	1.4	3.7	18	35	42	7.3	+
" 9.....	44	44	4.3	6.2	1.6	2.5	23	41	18	6.8	1.9	6.3	1.4	2.7	21	22	28	7.8	+
" 13.....	44	46	3.1	8.0	2.0	2.0	23	32	30	6.5	3.6	7.0	1.8	3.1	19	18	19	8.4	+
17.....	46	48	1.1	7.7	1.5	5.1	21	35	47	6.3	3.8	7.0	1.6	3.5	17	24	34	7.0	+
21.....	48	46	5.3	8.7	2.0	2.1	21	33	48	6.7	2.8	8.4	1.6	3.4	20	18	29	6.3	+
" 25.....	46	45	2.5	7.6	1.3	3.9	23	22	34	8.0	2.8	6.4	1.4	3.5	17	14	14	8.6	+
" 29.....	45	45	6.6	8.9	1.4	1.1	20	38	47	6.6	1.1	8.4	1.4	3.7	22	20	20	6.7	+
Average..	45	45	1.3	7.4	1.6	3.3	21	30	46	6.6	2.9	7.0	1.5	3.5	20	21	26	7.4	

Putrescibility test 48 hours at 100 degrees F.
Each sample in above table covers 48 hours.

Source of Influent Sprinkling Filter, Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	INFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
May 3.....	44	44	5.3	6.6	1.4	3.5	23	34	68	7.8	4.5	2.0	6.4	1.4	0.0	17	25	32	8.2	+	3.1
" 7.....	52	53	10.0	7.4	1.8	1.7	32	70	98	6.3	6.8	6.2	7.4	1.6	1.8	21	27	40	5.4	+	4.2
" 11.....	54	55	13.0	7.4	2.1	3.6	40	109	164	4.2	8.2	5.8	7.4	2.0	4.0	26	38	57	5.0	+	3.8
" 15.....	57	57	17.0	8.2	2.0	1.4	52	94	308	4.3	15.0	5.1	7.7	1.8	3.1	24	40	52	5.0	+	6.1
" 19.....	54	54	12.0	7.7	2.0	3.8	43	108	153	5.9	11.0	6.3	7.4	2.0	4.6	26	36	47	6.8	+	5.7
" 23.....	52	51	7.0	7.4	1.7	4.1	27	65	86	6.1	5.9	5.5	7.4	2.0	4.8	19	30	38	7.0	+	3.7
" 27.....	55	56	8.5	8.1	1.6	1.7	35	59	75	3.9	7.7	6.3	9.0	1.8	1.5	29	46	58	3.2	−	6.1
Average....	53	53	10.	7.5	1.8	2.8	36	77	136	5.5	8.4	5.3	7.6	1.8	2.8	23	35	46	5.8		4.7

Source of Influent Sprinkling Filter Nos. 1 and 2, Period of Flow Through Settling Basin 1.5 Hours.

1909 Date	Temp. Deg. F.		INFLUENT									EFFLUENT									
			Parts per Million									Parts per Million									
			Nitrogen									Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
June 3	58	58	9.9	8.5	1.9	3.1	11	78	107	5.7	9.1	5.7	8.0	2.0	3.1	26	27	31	7.0	+	4.9
" 7	58	58	8.0	6.8	2.2	3.6	32	65	90	5.7	5.8	5.2	7.3	2.2	5.2	22	29	37	6.8	+	3.3
" 11	58	58	6.6	7.8	2.0	2.9	31	55	85	4.2	6.1	3.0	8.7	1.4	2.5	24	23	32	5.0	+	4.3
15	60	60	5.9	6.5	1.9	4.0	29	49	87	5.8	4.9	2.6	6.7	2.0	3.0	20	18	28	6.1	+	2.4
" 19	56	56	6.6	6.7	1.7	5.6	28	49	73	6.6	5.4	2.2	7.5	1.4	6.5	18	16	21	5.7	+	3.3
" 24	67	67	6.0	7.2	1.7	3.5	31	57	75	4.6	7.2	1.0	7.4	1.6	3.2	22	20	20	3.9	+	5.0
" 28	65	65	4.0	5.0	1.8	6.6	18	29	12	5.8	3.1	2.7	4.7	1.8	7.1	10	16	25	5.1	+	2.5
Average	60	60	6.7	7.0	1.9	4.2	30	55	80	5.5	6.0	3.6	7.2	1.8	4.4	20	21	28	5.7		3.7

Appendix N.

Results of Chemical Analyses of Influent and Effluent of Settling Basin No. 2.

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 10.0 Hours.

1908 Date	INFLUENT Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	EFFLUENT Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter
Sept. 10	4.6	9.4	2.20	0.6	29	18	20	2.6	11.0	1.80	0.0	25	16	16
" 11	3.0	9.4	1.00	1.0	..	18	20	1.4	11.0	1.40	1.2	22	20	21
" 12	2.6	9.4	1.00	1.0	25	12	15	2.4	10.0	1.20	0.5	27	18	22
" 13	1.6	8.4	1.60	1.6	16	8	10	1.6	10.0	1.40	2.2	21	9	13
" 14	7.0	9.4	1.90	2.0	28	21	20	1.4	11.0	1.40	3.4	21	10	10
" 15	2.3	11.0	1.00	3.7	22	7	7	1.4	11.0	1.20	1.6	21	14	14
" 16	2.6	12.0	1.10	2.4	27	17	22	2.6	11.0	1.60	0.3	25	13	17
" 17	1.8	9.0	2.20	1.8	24	17	19	3.1	9.7	1.40	0.5	22	12	13
" 18	4.6	9.4	2.00	3.0	34	10	13	3.6	10.0	1.20	1.2	32	13	14
" 19	6.0	14.0	1.60	3.0	27	18	31	1.8	13.0	1.80	0.8	26	12	22
" 21	2.8	11.0	1.60	2.6	31	17	19	2.2	11.0	1.60	1.8	27	15	17
" 22	3.4	8.7	1.60	2.6	29	24	25	3.6	9.7	1.60	0.5	25	10	11
" 23	3.6	10.0	2.20	2.3	29	22	24	2.7	11.0	1.60	0.3	25	14	15
" 24	2.7	10.0	1.90	1.9	30	12	18	4.1	10.0	1.60	1.0	28	10	13
" 25	4.1	11.0	1.70	2.2	29	24	28	2.5	12.0	1.60	1.2	28	12	12
" 26	3.9	11.0	1.40	2.2	17	21	23	4.3	11.0	1.60	0.0	20	15	15
27	1.9	11.0	1.60	3.6	21	12	12	3.1	11.0	1.20	2.0	19	11	13
" 28	2.5	10.0	1.40	4.0	70	12	16	1.3	12.0	1.40	1.8	33	10	13
" 29	19.0	14.0	6.00	0.8	54	118	198	4.3	13.0	2.80	2.2	36	22	32
30	10.0	10.0	2.20	1.2	25	62	96	7.0	13.0	2.40	0.0	25	24	30
Average	4.5	10.4	1.9	4.0	28	23	32	2.8	11.0	1.6	1.1	25	14	17

Source of Influent Sprinkling Filter Nos 3 and 4, Period of Flow Through Settling Basin 10.0 Hours.

1908 Date	Temp. Deg. F.		INFLUENT Parts per Million							EFFLUENT Parts per Million							
			Nitrogen							Nitrogen							
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Putrescibility
Oct. 1	53	53	5.4	9.4	2.0	2.7	38	27	39	5.1	11.0	1.8	0.8	35	20	26	
" 2	49	51	4.9	8.9	1.5	2.8	33	25	37	3.1	9.0	1.2	2.0	28	16	20	
4	53	52	2.7	9.4	1.2	3.8	14	11	13	2.8	9.7	1.2	1.8	13	15	15	
" 5	53	52	3.7	8.4	1.2	3.0	24	15	19	2.7	9.4	1.4	1.4	20	12	17	
" 6	54	53	3.9	9.0	2.0	1.0	24	14	17	3.3	10.0	0.8	1.6	23	16	21	
" 7	56	53	...	....	...	...	..	..	..	3.5	13.0	0.9	0.1	28	16	17	
" 8	58	55	5.9	9.0	2.2	2.0	28	24	26	4.3	9.0	1.6	1.6	25	13	13	
" 9	57	56	3.1	11.0	1.6	3.4	27	11	13	2.5	12.0	1.2	1.2	24	8	9	
" 10	53	54	3.1	9.0	1.0	2.4	24	20	25	3.5	11.0	1.0	0.9	20	13	13	
" 11	55	55	1.5	9.4	1.2	3.6	16	6	18	3.2	9.7	0.9	1.5	20	4	13	
13	49	51	3.6	10.0	1.2	6.9	26	25	30	4.1	12.0	1.0	3.6	26	21	23	
14	51	49	5.7	8.6	1.7	1.9	28	16	23	5.3	8.0	1.0	2.4	24	11	14	
" 15	55	53	2.6	7.0	1.8	3.5	20	11	15	1.8	8.7	1.4	1.0	20	10	14	
" 16	56	56	3.3	8.0	1.2	1.6	24	15	21	2.6	8.7	0.8	0.7	23	9	12	
" 17	56	56	3.0	11.4	1.5	3.0	26	16	22	1.7	12.0	1.2	1.2	23	11	11	
18	56	57	2.8	9.7	2.0	2.6	15	10	14	2.2	8.7	1.2	1.6	16	5	8	
" 19	55	55	5.6	9.7	1.2	2.8	24	16	16	3.9	11.0	1.2	0.9	18	14	14	+
" 20	50	51	4.1	12.0	1.4	1.8	25	10	20	3.5	13.0	0.8	0.5	21	11	16	
" 21	48	47	5.9	11.0	1.6	1.0	27	18	24	4.9	12.0	0.8	0.5	24	8	12	−
" 22	48	46	8.2	10.2	2.6	2.7	34	32	48	4.3	13.0	1.2	0.5	28	13	20	−
" 23	49	49	7.4	8.7	4.4	0.0	31	28	36	2.7	13.0	1.4	0.5	26	21	25	
" 25	56	53	2.2	11.0	1.8	1.5	17	21	25	2.2	8.7	0.8	0.9	16	14	17	−
" 26	58	59	3.8	9.4	1.6	1.8	23	21	24	2.5	10.0	1.2	0.7	18	10	10	−
" 27	58	58	5.0	11.0	1.5	1.1	26	27	31	4.0	10.0	1.0	0.4	22	12	12	−
" 28	56	58	5.2	9.0	1.6	1.1	28	27	39	4.5	10.0	1.0	0.4	28	10	12	−
" 29	55	55	3.6	10.0	1.2	2.1	25	14	16	3.1	9.4	0.8	0.9	24	7	7	−
" 30	50	55	5.3	9.9	0.9	1.7	27	18	23	2.1	12.0	0.8	0.7	23	12	13	−
Average	54	53	4.3	9.6	1.7	2.4	25	18	24	3.3	10.5	1.1	1.1	23	12	15	

NOTE.—Rate of flow changed to 5.6 hours October 23d.

Source of Influent Sprinkling Filter Nos 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1908 Date	Temp. Deg. F.		INFLUENT Parts per Million								EFFLUENT Parts per Million								
			Nitrogen								Nitrogen								
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility
Nov. 1.....	40	37	7.3	13	0.5	2.6	43	28	68	8.9	3.9	13	0.6	1.3	24	17	23	1.6	+
" 2.....	40	39	6.2	11	0.9	2.8	32	33	49	7.4	4.1	12	0.8	2.4	25	10	14	6.9	+
" 3.....	45	44	4.8	11	1.1	2.2	27	34	53	6.9	4.5	10	0.8	1.8	26	18	26	5.3	+
" 4.....	47	48	7.6	11	0.9	2.2	31	37	42	6.1	5.1	11	0.8	1.1	27	16	19	4.1	+
" 5.....	43	42	6.8	16	1.3	1.1	36	33	45	5.0	6.7	13	1.2	0.7	33	36	47	5.0	+
" 6.....	43	42	7.8	12	1.0	1.0	34	28	34	4.9	6.5	13	0.7	1.2	32	19	24	3.7	+
" 8.....	46	45	3.7	11	1.1	2.4	20	29	30	6.6	2.9	13	0.7	1.4	17	15	15	3.3	+
" 9.....	48	47	5.2	13	1.7	0.4	27	26	40	5.3	4.5	13	1.0	0.7	24	20	25	4.4	+
" 10.....	49	49	4.7	12	0.8	2.1	28	21	21	4.9	2.9	13	0.6	1.1	24	12	12	3.6	+
" 11.....	50	50	5.3	12	1.0	1.5	29	27	35	4.1	3.5	12	0.7	1.0	24	12	16	2.3	+
" 12.....	48	47	7.2	12	0.8	1.7	28	24	25	4.3	7.3	11	0.7	1.5	25	22	22	3.4	+
" 13.....	44	44	3.9	12	0.6	1.7	28	27	31	3.6	5.3	13	0.5	1.3	27	11	11	2.7	−
" 15.....	42	42	3.8	13	0.7	3.4	20	29	31	6.6	3.7	13	0.5	2.1	19	14	14	7.8	−
" 16.....	44	43	6.7	12	1.2	1.3	27	31	35	4.9	3.8	14	0.7	1.2	24	19	25	4.2	+
" 17.....	45	45	6.9	11	1.1	1.5	30	25	26	4.7	5.4	12	0.5	1.4	28	21	21	3.5	−
" 18.....	46	45	5.4	12	0.9	0.4	29	23	33	3.7	3.6	13	0.6	0.7	25	13	16	2.6	−
" 19.....	47	46	5.1	12	0.7	1.3	31	32	41	4.5	4.8	11	0.5	1.1	24	20	21	3.1	+
" 20.....	47	47	5.0	13	0.7	1.4	25	19	22	3.4	3.4	12	0.4	1.1	24	18	18	2.3	+
" 23.....	47	46	5.6	11	1.0	1.3	27	28	35	6.6	3.8	12	0.6	1.5	23	16	19	4.4	+
" 24.....	49	48	6.0	12	1.0	1.1	30	24	36	4.5	4.0	13	0.7	0.4	27	18	19	2.7	+
" 26.....	52	52	2.3	13	0.8	2.3	18	23	26	3.2	2.6	12	0.7	1.1	17	13	20	1.4	−
" 27.....	47	49	6.1	14	1.0	1.9	28	27	29	4.4	3.0	14	0.8	1.0	24	12	12	2.4	+
" 29.....	48	45	2.7	13	0.7	2.7	19	23	28	6.7	3.2	13	0.5	1.9	22	18	18	5.2	−
" 30.....	48	46	9.9	14	1.0	1.6	39	29	43	4.3	6.2	14	0.7	1.2	32	14	25	3.5	+
Average..	46	45	5.6	12	0.9	1.7	29	28	36	5.2	4.4	13	0.7	1.3	25	17	20	3.7	

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1908 Date	Temp. Deg. F.		INFLUENT									EFFLUENT									
			Parts per Million									Parts per Million									
			Nitrogen									Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
Dec. 2.....	43	44	11.1	11.5	0.60	1.35	38	35	40	5.5	11.0	5.4	14.0	0.40	1.00	31	25	25	3.3	–	9.1
" 3.....	43	41	07.8	14.0	0.60	0.30	55	49	59	6.7	10.0	4.2	14.0	0.50	0.00	29	33	39	...	–	9.2
" 4.....	42	39	06.6	12.0	0.50	0.80	31	36	37	6.3	11.0	4.8	14.0	0.40	0.60	27	29	31	4.2	–	9.2
" 5.....	43	42	16.0	11.0	0.90	2.10	41	37	57	4.5	12.0	13.0	14.0	0.80	1.30	39	29	36	3.1	–	7.5
" 7.....	45	42	05.7	11.5	0.65	2.55	27	28	31	6.5	7.8	4.8	11.0	0.50	1.60	23	26	28	5.9	+	7.7
" 9....	43	44	05.2	12.0	1.05	0.85	27	24	30	5.4	10.0	5.4	12.0	0.70	0.40	27	25	30	4.1	+	7.8
" 11.....	43	42	06.4	10.2	0.55	0.85	31	38	46	4.9	11.0	4.4	11.0	0.50	0.70	29	19	21	4.2	–	11.0
" 15.....	45	42	07.9	11.5	0.75	1.65	28	32	37	4.8	8.3	5.0	12.0	0.70	1.60	26	29	29	4.4	–	7.4
" 17.....	44	45	07.2	12.5	1.00	....	28	24	32	4.4	8.3	5.9	12.0	0.90	....	26	20	28	3.5	+	7.8
" 19.....	43	44	08.0	11.5	0.70	....	25	26	32	4.6	8.8	7.1	12.0	0.60	....	23	18	18	5.2	+	7.8
" 21.....	41	41	05.9	14.5	0.95	1.78	28	32	37	6.2	8.6	5.5	14.0	0.80	0.90	26	24	28	1.4	–	8.1
" 26.....	42	42	07.1	15.0	1.15	1.50	25	41	46	6.0	7.2	7.1	14.0	1.10	1.80	22	33	35	3.4	+	6.4
" 28.....	42	40	08.6	14.5	1.45	1.30	31	40	43	6.8	10.0	6.5	15.0	1.40	1.00	27	37	41	6.5	–	9.1
" 30.....	43	43	08.4	12.5	1.10	1.75	32	40	40	5.4	11.0	6.5	13.0	0.90	1.00	29	30	30	4.8	–	9.9
Average..	43	42	8.0	12.	.85	1.4	32	34	41	5.6	10.0	6.1	13.	0.73	0.99	27	27	30	4.2		8.4

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen										EFFLUENT Parts per Million Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
January....	43	43	8.3	11.0	1.3	1.20	28	34	35	6.4	+	8.7	6.8	12.0	1.2	1.20	25	19	19	4.6	+	8.1
	42	41	6.9	14.0	1.1	1.60	33	38	47	5.6	−	9.8	7.0	13.0	1.0	1.60	29	24	28	5.4	+	9.0
	42	42	6.4	15.0	0.9	1.60	38	29	44	5.4	−	12.1	7.0	16.0	0.8	0.70	33	14	23	4.2	+	11.0
	42	42	10.0	15.0	0.7	0.81	35	43	51	5.0	−	10.1	7.0	16.0	0.4	0.42	38	33	42	3.3	−	10.0
	43	42	7.6	15.0	1.0	1.20	38	32	35	5.2	−	12.0	8.0	14.0	0.8	0.80	33	28	28	4.4	+	9.7
	43	42	4.9	11.0	1.2	2.10	29	32	40	4.9	+	7.0	4.4	14.0	1.0	1.10	26	..	24	4.0	+	6.2
	42	42	8.8	12.0	1.0	1.80	34	28	41	5.7	+	8.3	5.4	15.0	0.8	1.00	29	18	28	5.0	+	8.9
Average....	42	42	7.6	13.	1.0	1.5	34	34	42	5.5		9.7	6.5	14.	0.9	.97	30	23	27	4.4		9.0

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F.		INFLUENT Parts per Million								Putrescibility	Oxygen Consumed 5 Min. Cold Test	EFFLUENT Parts per Million								Putrescibility	Oxygen Consumed 5 Min. Cold Test
			Nitrogen										Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved			Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved		
Feb. 13.....	47	12	8.1	15.0	0.70	2.3	10	36	47	4.8	-	12.0	8.0	13.0	0.80	0.7	32	18	26	5.7	+	9.6
" 17.....	16	12	7.6	12.0	0.96	2.3	42	51	61	5.6		11.0	7.0	13.0	0.90	0.9	32	24	24	7.4	+	8.6
" 21.....	11	10	3.1	6.2	0.80	2.60	17	38	11	7.8	[illegible]	4.4	2.6	7.0	0.80	2.3	14	23	23	7.3	+	3.4
Average.	15	11	6.1	11.	.82	2.4	33	42	50	6.1		9.1	5.9	11.	.83	1.3	26	22	24	6.8		7.2

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	Influent, Nitrogen, Organic	Influent, Nitrogen, Free Ammonia	Influent, Nitrogen, Nitrites	Influent, Nitrogen, Nitrates	Influent, Oxygen Consumed	Influent, Volatile Matter	Influent, Suspended Matter	Influent, Oxygen Dissolved	Influent, Oxygen Consumed 5 Min. Cold Test	Effluent, Nitrogen, Organic	Effluent, Nitrogen, Free Ammonia	Effluent, Nitrogen, Nitrites	Effluent, Nitrogen, Nitrates	Effluent, Oxygen Consumed	Effluent, Volatile Matter	Effluent, Suspended Matter	Effluent, Oxygen Dissolved	Putrescibility	Effluent, Oxygen Consumed 5 Min. Cold Test
Mar. 2.....	44	41	6.7	11	1.10	0.5	33	39	54	6.5	8.9	4.7	9.7	1.2	0.6	24	23	25	7.6	+	7.0
" 6.....	44	40	6.5	15	1.00	0.5	36	41	53	6.3	11.0	8.0	14.0	0.9	0.3	29	21	32	6.7	+	8.8
" 10.....	45	42	8.1	15	0.95	0.5	32	34	49	...	10.0	6.6	15.0	1.0	0.6	30	21	33	6.5	+	7.8
" 14.....	44	41	4.6	14	0.95	1.5	25	31	38	...	6.2	4.4	12.0	0.8	1.1	22	14	26	6.4	+	5.3
" 18.....	45	40	8.2	13	0.90	1.1	35	32	41	...	7.9	7.2	12.0	0.9	1.6	28	19	24	6.2	+	6.3
" 22.....	43	40	6.1	14	0.95	2.5	28	35	45	...	6.5	6.0	12.0	0.8	2.0	25	20	24	5.0	+	5.0
" 26.....	43	40	3.9	11	0.95	1.5	25	25	28	...	7.2	4.0	10.0	1.0	1.2	23	14	15	6.8	+	7.8
" 30.....	43	40	4.8	10	1.70	1.1	29	44	56	...	7.7	4.6	10.0	1.2	1.2	24	34	41	7.1	+	5.8
Average.	44	41	6.1	13	1.1	1.2	30	35	46	...	8.2	5.7	12.	1.0	1.1	26	21	28	6.5	.	6.7

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F.		INFLUENT Parts per Million								EFFLUENT Parts per Million								
			Nitrogen								Nitrogen								
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility
April 3.....	43	42	3.9	9.4	1.3	1.2	23	25	29	4.7	4.0	9.0	1.2	0.7	22	17	18	6.0	+
" 7.....	46	45	4.1	8.5	1.5	1.3	22	29	33	6.9	3.6	9.0	1.6	1.0	18	8	8	6.3	+
" 11.....	40	41	4.3	9.7	1.6	1.3	21	29	33	8.4	1.6	11.0	1.6	0.8	18	19	20	6.3	+
" 15.....	45	45	4.6	6.7	1.6	1.6	22	26	32	6.1	5.0	6.7	1.2	1.2	18	16	20	6.0	+
" 19.....	48	47	5.2	9.9	1.4	2.4	21	27	29	4.8	4.2	9.0	1.4	1.9	18	13	13	5.7	+
" 23.....	47	47	7.3	12.0	1.1	2.0	32	23	37	7.3	5.4	11.0	1.2	1.4	24	22	25	5.2	+
" 27.....	47	46	10.3	11.0	1.4	1.6	30	32	40	7.8	7.4	11.0	1.2	1.2	24	16	24	5.9	+
Average..	45	45	5.7	9.6	1.5	1.6	24	27	33	6.6	4.5	9.5	1.3	1.2	20	16	18	5.9	

Putrescibility test—48 hrs. at 100° F.

Note—Each sample covers 48 hours.

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F.		INFLUENT									EFFLUENT									
			Parts per Million									Parts per Million									
			Nitrogen									Nitrogen									
	Influent	Effluent	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
May 1.....	44	44	5.8	9.4	1.3	1.2	25	37	46	5.1	5.0	4.5	8.7	1.0	1.4	22	21	23	5.5	+	4.9
" 5.....	46	47	11.0	11.0	1.8	1.4	33	56	76	5.3	8.4	4.4	10.0	1.6	1.4	23	19	23	6.1	+	5.2
" 9.....	55	55	11.0	10.0	1.6	2.0	36	92	121	4.6	7.5	5.4	9.4	1.6	1.0	17	20	20	4.1	+	3.4
" 13.....	53	52	17.0	11.0	2.4	0.7	49	129	186	4.4	14.0	7.2	10.0	1.8	1.3	26	30	35	5.5	+	6.9
" 17.....	54	54	11.0	9.0	1.9	2.7	36	76	119	5.5	7.2	3.2	8.4	1.6	2.3	15	17	22	5.5	+	2.0
" 21.....	54	54	12.0	10.0	2.2	0.4	42	96	146	5.5	11.0	5.6	9.7	2.0	1.0	23	31	37	5.8	+	5.3
" 25.....	54	55	11.0	11.0	2.0	1.4	38	74	112	4.2	8.9	3.7	12.0	1.8	1.8	23	22	27	5.5	+	4.5
" 28.....	58	58	15.0	10.0	1.9	1.0	45	118	172	5.4	8.7	5.2	9.7	1.8	0.9	26	21	28	4.6	+	4.2
Average..	52	52	12.	10.	1.9	1.4	38	85	122	5.0	8.8	4.9	9.7	1.7	1.4	22	23	27	5.3		4.6

Source of Influent Sprinkling Filter Nos. 3 and 4, Period of Flow Through Settling Basin 5.6 Hours.

1909 Date	Temp. Deg. F. Influent	Temp. Deg. F. Effluent	INFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Volatile Matter	Suspended Matter	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
June 1.....	56	57	8.5	12.0	2.2	0.0	43	107	143	3.8	11.5	6.7	11.0	2.2	0.0	26	29	30	5.1	+	3.9
" 5.....	59	60	7.6	11.0	0.4	0.2	43	54	73	3.3	8.5	7.5	13.0	0.8	0.0	26	23	30	2.8	+	5.9
" 9.....	57	58	11.9	14.5	0.4	0.4	39	76	36	2.6	11.1	6.9	14.0	0.4	0.0	29	34	35	3.4	+	8.3
" 13.....	59	59	6.6	8.2	1.2	1.3	28	53	72	4.4	5.8	3.7	10.0	1.8	0.7	20	18	20	4.5	+	2.7
" 17.....	59	60	9.0	11.5	1.4	0.8	36	62	85	3.8	8.4	3.1	12.0	1.0	0.2	23	18	20	2.9	+	5.4
" 22.....	63	63	11.5	8.2	2.3	0.3	39	85	128	5.2	9.5	6.3	8.4	2.2	0.8	23	25	30	5.2	+	4.9
" 26.....	68	68	6.1	11.0	2.0	0.5	28	39	50	2.2	6.9	4.0	11.0	1.8	0.3	22	24	24	2.3	+	4.6
" 30.....	65	65	4.0	11.0	1.4	0.2	28	30	32	2.2	6.4	3.8	12.0	1.6	0.0	21	16	16	2.5	+	4.1
Average..	61	61	8.1	11.0	1.4	0.5	35	63	77	3.4	8.5	5.2	11.	1.5	0.2	24	23	26	3.6		5.0

Appendix O.

Results of Chemical Analyses of Influent and Effluent of Sand Filter No. 1.

Preparatory Treatment Received by Influent Settled Sprinkling Filter—Effluent from Filters 3 and 4.

1908 Date	Gals. of Sewage Applied per Acre Daily. Average for Week	Temp. Deg. F.		EFFLUENT Parts per Million Nitrogen			EFFLUENT Parts per Million Nitrogen					
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved
Oct. 1.....	300,000	62	56	5.1	11.0	29	0.92	1.7	1.60	1.2	18	7.2
" 2.....		61	53	3.7	6.4	24	0.92	0.7	0.60	9.4	11	7.9
4.....		59	52	2.5	10.0	19	0.90	1.8	0.10	8.0	11	9.2
" 5.....		58	51	1.5	9.4	18	0.62	2.0	0.60	8.9	9	9.1
" 6.....		60	52	2.7	11.0	20	0.81	2.7	0.40	7.7	11	9.3
" 8.....		60	53	4.5	8.0	22	2.00	4.4	0.80	6.1	13	9.6
" 9.....		60	55	1.7	12.0	22	2.20	4.7	0.60	8.3	12	9.4
" 10.....		59	55	2.7	11.0	20	1.20	3.3	0.70	7.2	13	7.7
" 11.....		57	54	3.1	9.4	18	0.40	4.0	0.60	8.3	11	6.8
" 13.....		58	50	2.9	12.0	23	1.00	6.7	0.60	5.8	15	8.0
" 15.....		59	51	2.1	8.0	14	1.60	3.3	1.20	4.8	11	9.4
" 16.....		58	54	2.1	8.0	20	0.90	3.0	0.60	4.8	13	5.7
" 17.....		59	56	2.7	9.0	20	0.47	4.0	0.60	5.8	12	12.0
" 18.....		57	..	1.4	8.7	14	0.47	3.0	1.00	6.3	9	11.0
" 19.....		60	..	1.9	11.0	18	0.47	4.0	1.00	5.2	7	11.0
" 20.....		58	54	5.1	13.0	19	1.30	5.0	0.60	4.6	13	8.0
25.....		56	..	1.1	9.0	15	0.80	3.3	0.80	5.6	9	9.4
Average....	....	59	53	2.7	9.8	20	1.00	3.4	0.73	6.3	12	8.9

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1908 Date	Gals. of Sewage Applied per Acre Daily.	INFLUENT Parts per Million Nitrogen Organic	INFLUENT Parts per Million Nitrogen Free Ammonia	INFLUENT Parts per Million Oxygen Consumed	EFFLUENT Parts per Million Nitrogen Organic	EFFLUENT Parts per Million Nitrogen Free Ammonia.	EFFLUENT Parts per Million Nitrogen Nitrites	EFFLUENT Parts per Million Nitrogen Nitrates	EFFLUENT Parts per Million Oxygen Consumed	EFFLUENT Parts per Million Oxygen Dissolved
Nov. 1.....	363,000	4.5	12	20	0.8	4.7	0.20	4.3	11	9.4
" 12.....	"	3.3	11	18	1.4	7.0	0.60	1.2	10	8.6
" 16.....	"	2.0	13	24	0.9	8.0	0.50	4.1	8	7.9
" 20.....	"	1.4	12	22	0.7	8.0	0.30	2.8	11	7.4
" 24.....	"	2.8	11	19	0.7	8.0	0.40	3.6	10	6.4
" 30.....	"	4.6	12	23	0.7	7.0	0.40	6.0	13	8.4
Average..	....	3.1	12	21	0.9	7.1	0.40	3.6	11	8.0

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1908 Date	Gals. of Sewage Applied per Acre Daily.	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen					EFFLUENT Parts per Million Nitrogen							
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Nitrites	Nitrates	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Turbidity	Putrescibility
Dec. 7....	550,000	40	40	2.6	12.0	17	0.40	1.50	0.50	6.0	0.20	4.2	11	8.9	Slight	+
" 13.....		40	40	4.0	9.4	21	0.40	1.40	0.70	5.0	0.30	3.8	11	7.5		+
" 18.....		43	43	4.9	9.0	19	0.60	....	0.65	5.3	1.00	...	11	7.9		+
" 27.....		40	41	2.5	13.0	23	0.90	1.40	0.75	4.6	1.60	8.4	10	8.9		+
Average..	....	41	41	4.0	11.	20	0.58	1.4	0.65	5.2	0.78	5.5	11	8.3		

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Gals. of Sewage Applied per Acre Daily.	Time Sewage Remained on Surface	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen				INFLUENT Parts per Million Nitrogen						
			Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Oxygen Dissolved	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Putrescibility
Jan. 3.....	550,000	0.0	42	40	3.7	13.0	19	6.4	0.60	5.0	1.4	8.6	11	7.0	+
" 10.....			42	40	2.6	11.0	22	5.6	0.40	4.0	0.8	12.0	10	6.2	+
" 19.....			42	40	4.8	12.0	30	5.2	0.50	3.3	1.6	11.0	12	7.0	+
25.....			43	42	2.8	12.0	27	5.1	0.50	4.7	2.0	12.0	12	5.8	+
Average..	....	...	42	41	3.4	12.	25	5.6	.50	4.2	1.5	11.	11	6.5	

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Gals. of Sewage Applied per Acre Daily.	Temp. Deg. F.		INFLUENT Parts per Million			EFFLUENT Parts per Million						Putrescibility
				Nitrogen			Nitrogen						
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	
Feb. 1.....	800,000	44	40	4.0	11.0	27	0.7	2.0	2.40	5.50	14	7.8	+
" 12.....	"	44	40	7.2	12.0	26	0.7	4.4	2.20	7.70	12	7.7	+
18.....		44	40	5.8	13.0	31	1.1	6.4	2.40	7.50	14	6.5	+
" 24.....		44	40	8.7	13.0	21	1.0	5.7	2.40	6.0	10	7.9	+
Average....	....	44	40	6.4	12.	26	.88	4.6	2.4	6.7	13	7.5	

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Gals. of Sewage Applied per Acre Daily.	Temp. Deg. F.		INFLUENT Parts per Million				EFFLUENT Parts per Million						
				Nitrogen				Nitrogen						
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Oxygen Consumed 5 Min. Cold Test
Mar. 3.....	800,000	44	40	3.0	9.4	22	...	1.5	5.7	2.2	4.2	11	9.1	...
" 9.....	"	44	41	5.2	12.0	24	...	1.4	6.0	2.4	4.0	12	9.2	...
" 15.....		44	40	7.6	10.0	22	...	1.0	6.4	3.6	1.4	10	8.6	...
" 21.....		40	40	5.6	12.0	23	...	1.0	5.7	4.8	3.2	13	9.2	...
" 28.....		40	40	3.0	10.0	17	4.1	0.91	7.0	3.6	19.0	10	8.8	2.2
Average..	....	42	40	4.9	11.	22	4.1	1.2	6.2	3.3	6.4	11	9.0	2.2

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Gals. of Sewage Applied per Acre Daily.	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen				INFLUENT Parts per Million Nitrogen								
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Turbidity	Putrescibility	Oxygen Consumed 5 Min. Cold Test
April 3.....	1,000,000	41	40	4.4	9.0	20.0	5.3	1.3	5.0	3.2	3.2	10.0	9.2	Slight	+	2.2
" 12.....		44	44	1.8	8.0	15.0	3.2	0.7	4.0	3.6	3.2	11.0	9.5		+	1.2
" 20.....		46	46	3.6	8.0	18.0	2.7	0.8	3.0	3.6	3.9	11.0	9.7		+	1.2
" 27.....		47	46	7.4	11.0	18.0	3.8	4.5	8.7	3.6	1.6	12.0	9.7		+	1.1
Average..	....	45	44	4.3	9.0	18.	3.8	1.8	5.2	3.5	3.0	11.0	9.5			1.4

Each sample covers 1-44 hours.

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Temp. Deg. F.		INFLUENT						EFFLUENT							
			Parts per Million						Parts per Million							
			Nitrogen						Nitrogen							
	Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Nitrites	Nitrates	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
May 3.....	53	43	4.4	8.4	20	1.1	1.8	4.8	0.8	5.4	4.0	1.3	12	9.2	+	4.4
" 9.....	49	50	5.4	9.4	19	1.2	1.5	4.7	1.6	3.7	3.2	5.7	13	8.9	+	4.3
" 16.....	48	55	6.3	9.7	23	1.6	1.6	6.5	1.3	3.0	4.0	1.2	13	6.9	+	4.3
" 25.....	53	53	6.7	9.0	22	1.6	2.3	4.5	0.88	2.4	3.2	9.8	12	6.7	+	2.0
Average..	51	50	5.7	9.1	21	1.4	1.8	5.1	1.1	3.6	3.6	4.5	12	7.9		3.7

Preparatory Treatment Received by Influent Settled Sprinkling Filter Effluent from Filters 3 and 4.

1909 Date	Gals. of Sewage Applied per Acre Daily.	Temp. Deg. F.		INFLUENT Parts per Million Nitrogen				EFFLUENT Parts per Million Nitrogen							
		Influent	Effluent	Organic	Free Ammonia	Oxygen Consumed	Oxygen Consumed 5 Min. Cold Test	Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved	Putrescibility	Oxygen Consumed 5 Min. Cold Test
June 3.....	1,000,000	51	58	4.1	12.0	24	4.6	1.10	3.3	1.2	11.8	11	6.0	+	1.7
" 9.....		59	60	8.8	12.0	24	6.3	1.00	2.3	0.6	11.1	10	3.0	+	2.0
' 16.....		59	60	3.9	12.0	23	4.2	0.65	4.0	0.8	9.6	10	2.7	+	1.7
' 22.....		60	59	5.2	8.7	20	3.7	0.31	2.0	0.8	12.2	9	4.8	+	1.7
" 28.....		66	61	3.6	9.0	19	3.0	0.30	2.0	0.3	12.0	10	2.9	+	2.0
Average....	....	60	60	5.1	11.	22	4.4	.67	2.7	0.7	11.3	10	3.9		1.8

APPENDIX P.

Results of Chemical Analyses of Influent and Effluent of Sand Filter No. 2.

Preparatory Treatment Received by Influent Unsettled Crude Sewage.

1908 Date	Gallons of Sewage Applied per Acre Daily	EFFLUENT — Parts per Million — Nitrogen — Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Oxygen Dissolved
Sept. 12.....	100,000	2.6	1.00	1.2	3.6	18.0	...
" 15.....	"	0.65	0.35	0.6	13.0	11.0	...
" 16.....	"	1.50	0.22	0.8	5.4	11.0	...
" 18.....	"	1.10	2.10	0.7	8.0	13.0	...
" 21.....	"	1.50	2.90	1.0	6.5	11.0	8.6
" 22.....	"	0.84	1.20	0.5	7.8	9.6	8.9
" 23.....	"	1.00	1.40	0.6	8.1	11.0	7.3
" 25.....	"	1.40	1.60	0.6	12.0	12.0	8.3
" 26.....	"	0.44	1.60	0.8	11.0	12.0	7.6
" 27.....	"	1.20	1.00	0.4	7.7	11.0	6.4
" 28.....	"	0.82	1.30	0.4	12.0	9.1	7.4
" 29.....	"	2.30	0.70	1.2	6.7	13.0	7.9
Average....	....	1.28	1.28	0.73	8.5	11.8	7.8

Preparatory Treatment Received by Influent Raw Unsettled Sewage.

1908 Date	Gallons of Sewage Applied per Acre Daily	EFFLUENT: Parts per Million, Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed
Oct. 1.....	100,000	....	....	1.00	17.0	17.0
" 2.....	"	0.84	0.80	2.40	16.0	12.0
" 4.....	"	0.94	0.50	2.00	18.0	19.0
" 5.....	"	0.55	0.45	2.40	23.0	10.0
" 8.....	"	2.80	0.80	1.00	18.0	17.0
" 9.....	"	0.62	0.70	1.00	28.0	12.0
" 10.....	"	1.20	1.90	1.60	22.0	18.0
" 11.....	"	0.82	1.70	2.80	35.0	12.0
" 13.....	"	1.90	0.70	1.80	36.0	12.0
" 15.....	"	0.74	0.40	0.80	30.0	11.0
" 16.....	"	0.43	0.20	0.20	37.0	9.0
" 17.....	"	0.12	1.00	0.02	33.0	9.0
" 19.....	"	1.00	0.70	0.60	34.0	7.0
" 20.....	"	1.80	0.70	0.60	18.0	15.0
" 25.....	"	1.00	0.10	0.60	31.0	10.0
Average..	....	1.05	0.76	1.25	26.0	13.0

Preparatory Treatment Received by Influent Unsettled Crude Sewage.

1908 Date	Gals. of Sewage Applied per Acre Daily.	INFLUENT Parts per Million: Nitrogen: Organic	Free Ammonia	Oxygen Consumed	EFFLUENT Parts per Million: Nitrogen: Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed
Nov. 4.....	100,000	....	..	...	2.4	2.7	0.50	16.0	19
" 6.....	"	....	..	...	...	7.0	0.40	12.0	31
" 9.....	"	....	..	...	2.3	7.0	2.40	19.0	14
" 15.....	"	17.0	24	55	0.7	4.4	0.20	7.6	11
" 17.....	"	37.0	22	114	1.3	3.7	0.40	25.0	11
" 19.....	"	32.0	21	115	7.0	5.3	0.70	37.0	12
" 23.....	"	48.0	19	130	0.52	5.0	1.10	46.0	13
" 29.....	"	9.2	24	52	0.90	2.3	0.40	44.0	10
Average....	....	29.0	22	93	2.2	4.7	0.76	26.0	15

Preparatory Treatment Received by Influent Unsettled Crude Sewage.

1908 Date	Gals. of Sewage Applied per Acre Daily.	INFLUENT Parts per Million Nitrogen Organic	Nitrogen Free Ammonia	Oxygen Consumed	Nitrites	Nitrates	EFFLUENT Parts per Million Nitrogen Organic	Nitrogen Free Ammonia	Nitrogen Nitrites	Nitrogen Nitrates	Oxygen Consumed	Turbidity
Dec. 1.....	100,000	48	21	138	0.40	1.10	0.40	5.0	0.60	43	16	Slight color and turbidity after raking
" 9....	100,000	44	15	122	0.10	1.00	0.51	5.3	0.40	24	16	
" 16.....	100,000	33	16	106	0.10	1.00	0.68	6.4	0.20	29	12	
" 23.....	100,000	35	18	119	0.20	0.90	0.60	4.0	0.40	15	13	
" 30.....	100,000	46	19	115	0.10	0.10	0.59	4.3	0.20	25	10	
Average....		41	18	120	0.18	0.82	0.56	5.0	0.36	27	14	

Preparatory Treatment Received by Influent Unsettled Crude Sewage.

1909 Date	Gals. of Sewage Applied per Acre Daily.	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Oxygen Consumed	Color	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Putrescibility	Remarks
Jan. 5.....	100,000	35.0	19.0	115	Straw Colored	0.68	7.0	0.20	23	12	+	Surface raked once during month.
" 12.....		52.0	14.0	136		0.56	2.0	0.10	24	15	+	
" 19.....		47.0	14.0	132		0.64	6.4	0.20	19	19	+	
" 26.....		33.0	11.0	118		1.90	9.0	0.10	18	17	+	
Average..	....	42.	15.	125		.95	6.1	.15	21	16		

1909 Date	Gals. of Sewage Applied per Acre Daily.	INFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Oxygen Consumed	EFFLUENT Parts per Million Nitrogen Organic	Free Ammonia	Nitrites	Nitrates	Oxygen Consumed	Putrescibility	Remarks
Feb. 4.....	100,000	48.0	16.0	148	2.4	10.0	0.10	16.0	23	+	
" 10.....	"	33.0	13.0	136	0.8	6.0	0.90	27.1	16	+	
" 17.....		34.0	14.0	133	1.2	6.0	0.20	14.8	15	+	
" 22.....		23.0	12.0	98	0.5	8.3	0.20	17.8	17	+	Two inches of sand removed from surface.
" 28.....		19.0	11.0	105	1.0	5.0	0.50	24.0	17	+	
Average....	....	31.	13.	124	1.2	7.1	.38	20.	18		

This Tank not operated after Feb. 28th.

APPENDIX Q.

Results of Chemical Analyses of Station Sewage Samples Taken in Proportion to the Flow, and Samples taken throughout the Day.

1908 Date	Temp. Deg. F.	Nitrogen: Organic: Total	Nitrogen: Organic: Dissolved	Nitrogen: Organic: Suspended	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed: Total	Oxygen Consumed: Dissolved	Oxygen Consumed: Suspended	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca. Co. 3	Oxygen Dissolved	Carbonic Acid	Fats
						Parts per Million												
Dec. 15.....	49	19.0	12.0	7.0	11.0	0.20	1.00	84	44	40	158	164	122	42	204	0.9	−7	37.0
" 16.....	49	20.0	11.0	9.0	14.0	0.30	0.60	86	44	42	166	186	134	52	222	2.0	−13	....
' 17.....	49	22.0	11.0	11.0	14.0	0.40	....	84	44	40	158	230	166	64	228	1.0	−10	34.0
' 18.....	49	18.0	13.0	5.0	15.0	0.30	....	80	44	36	168	190	124	66	250	0.7	−13	....
" 19.....	48	19.0	11.0	8.0	15.0	0.05	....	78	40	38	158	234	152	82	234	2.4	−4	24.0
' 20.....	47	10.0	7.0	3.0	15.0	0.10	0.50	38	18	20	56	88	86	2	174	5.6	13	....
' 21.....	48	24.0	15.0	9.0	14.0	0.25	1.15	95	54	41	196	326	210	116	210	1.1	−23	79.0
' 22.....	48	26.0	20.0	6.0	12.0	0.30	1.20	98	49	49	218	490	280	210	214	1.2	−16	....
23.....	48	19.0	13.0	6.0	11.0	0.30	0.90	92	52	40	188	276	178	98	208	1.2	−15	45.0
" 24.....	48	19.0	6.0	13.0	16.0	0.05	0.00	92	43	49	198	330	230	100	268	1.0	−6	....
" 25.....	47	11.0	6.4	4.6	15.0	0.10	0.40	49	24	25	66	158	138	20	170	0.8	12	47.0
26.....	48	25.0	14.0	11.0	15.0	0.45	0.85	87	42	45	140	260	200	60	244	0.4	−9	....
27.....	46	13.0	9.2	3.8	17.0	0.10	0.50	54	23	31	48	146	134	12	180	3.0	−12	53.0
" 28.....	48	29.0	14.0	15.0	11.0	0.35	1.05	104	54	50	166	436	276	160	224	1.0	−32	....
29.....	48	25.0	15.0	10.0	12.0	0.35	1.15	108	60	48	164	428	258	170	200	0.9	−30	52.0
30.....	48	30.0	18.0	12.0	11.0	0.30	1.30	102	56	46	168	392	244	148	192	0.6	−28	....
" 31.....	48	25.0	16.0	9.0	13.0	0.20	1.40	100	57	43	180	250	194	56	208	1.6	−14	....
Average..	48	21.0	12.0	8.4	14.0	2.4	.86	84	44	40	153	270	184	86	214	1.5	−12	46.

1908 Date	Nitrogen: Organic: Total	Nitrogen: Organic: Dissolved	Nitrogen: Organic: Suspended	Nitrogen: Free Ammonia	Nitrogen: Nitrites	Nitrogen: Nitrates	Oxygen Consumed: Total	Oxygen Consumed: Dissolved	Oxygen Consumed: Suspended	Chlorine	Suspended Matter: Total	Suspended Matter: Volatile	Suspended Matter: Fixed	Alkalinity in Terms of Ca Co 3	Carbonic Acid
	Parts per Million														
Dec. 15.....	22.0	13.0	9.0	12	0.40	1.10	98	51	47	188	230	158	72	222	-17
" 16.....	28.	16.0	12.0	12	0.30	1.40	93	51	42	192	254	176	78	238	-17
" 17.....	22.	15.0	7.0	11	0.20	....	88	55	33	166	238	144	94	236	-16
" 18.....	25.	17.0	8.0	12	0.25	....	92	50	42	192	262	156	106	202	-12
" 19.....	26.	15.0	11.0	12	0.40	....	84	45	39	174	224	150	74	234	-9
" 20.....	13.	8.4	4.6	17	0.10	0.70	45	18	27	58	116	114	2	174	16
" 21.....	27.	17.0	10.0	14	0.25	1.25	112	60	52	212	396	252	144	210	-27
" 22.....	26.	16.0	10.0	12	0.25	1.15	103	56	47	236	470	278	192	216	-13
" 23.....	25.	16.0	9.0	11	0.30	0.90	102	58	44	214	356	218	138	200	-19
" 24.....	20.	11.0	9.0	18	0.05	0.25	96	45	51	196	330	242	88	270	00
" 25.....	14.	5.8	8.2	14	0.25	0.25	58	30	28	108	232	184	48	206	8
" 26.....	29.	19.0	10.0	14	0.40	0.90	99	51	48	158	372	276	96	222	-15
" 27.....	15.	9.0	6.0	18	0.30	0.30	62	24	38	51	188	170	18	170	-15
" 28.....	36.	19.0	17.0	13	0.40	1.20	121	53	68	188	660	420	240	224	-49
" 29.....	32.	16.0	16.0	13	0.40	1.10	128	64	64	204	550	310	240	216	-40
" 30.....	30.	18.0	12.0	14	0.30	1.30	112	58	54	190	460	254	206	212	-35
" 31.....	30.	18.0	12.0	13	0.20	1.60	111	62	49	204	294	220	74	208	-20
Average....	25.	15.	10.	14	0.28	0.96	95	49	46	172	331	219	112	215	-16

Appendix R.

Daily Temperatures of Station Sewage and Various Effluents.

Table Showing Range of Temperature in Crude Sewage Preparatory Tanks and Filtering Devices during the Winter.

Date 1908	Crude Sewage	Septic Tank	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4	Settling Basin No. 1	Settling Basin No. 2	Sand Filter No. 1
Dec. 1.....	56	50	50	50	..	..	50	..	..
" 2.....	51	50	..	..	48	36	..	44	..
" 3.....	50	..	..	..	..	37	..	41	..
" 4.....	50	..	..	..	..	40	..	39	..
" 5.....	50	..	48	48	44	..	48	42	..
" 6.....	47	..	..	..	..	..	..	..	..
" 7.....	49	48	46	46	45	44	46	42	40
" 8.....	49	48	46	46	..	..	46	..	..
" 9.....	50	48	..	..	46	40	..	44	..
" 10.....	49	48	46	46	..	..	46	..	..
" 11.....	49	48	..	..	44	41	..	42	..
" 12.....	49	48	46	46	..	..	46	..	..
" 13.....	48	47	..	..	44	38	..	..	40
" 14.....	49	47	47	47	..	..	46	..	..
" 15.....	49	48	..	..	46	43	..	42	..
" 16.....	49	48	47	47	..	..	48	..	..
" 17.....	49	48	..	..	46	41	..	45	..
" 18.....	49	48	46	46	..	..	46	..	43
" 19.....	48	48	..	..	45	41	..	44	..
" 20.....	47	47	46	46	..	..	46	..	..
" 21.....	48	47	..	..	45	37	..	41	..
" 22.....	48	48	46	46	..	..	46	..	..
" 23.....	48	47	46	46	..	..	46	..	..
" 24.....	48	..	..	..	..	..	..	..	..
" 25.....	47	46	..	..	..	..	..	..	..
" 26.....	48	47	..	..	45	38	..	42	..
" 27.....	46	46	46	46	..	..	46	..	41
" 28.....	48	47	..	..	45	37	..	40	..
" 29.....	48	48	46	46	..	..	46	..	..
" 30.....	48	47	..	..	45	41	..	43	..
" 31.....	48	47	46	46	..	..	46	..	..
Average..	49	48	47	47	45	39	47	42	41

Table Showing Range of Temperature in Crude Sewage Preparatory Tanks and Filtering Devices during the Winter.

Date 1909	Crude Sewage	Septic Tank	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4	Settling Basin No. 1	Settling Basin No. 2	Sand Filter No. 1
Jan. 1.....	..	..	..	..	..	..	..	..	..
" 2.....	48	47	..	..	..	..	..	..	..
" 3.....	45	45	44	44	..	..	44	..	40
" 4.....	48	46	..	..	..	..	..	..	..
" 5.....	48	47	..	..	45	42	..	43	..
" 6.....	47	46	..	..	..	..	..	..	..
" 7.....	46	45	44	44	..	..	44	..	..
" 8.....	46	45	..	..	..	..	..	..	..
" 9.....	47	46	..	..	43	40	..	41	..
" 10.....	45	46	..	..	..	..	..	..	40
" 11.....	47	46	44	44	..	..	44	..	..
" 12.....	48	46	..	..	..	..	..	..	..
" 13.....	48	47	..	..	44	40	..	42	..
" 14.....	48	48	..	..	..	..	..	..	..
" 15.....	48	47	46	46	..	..	46	..	..
" 16.....	47	47	..	..	..	..	..	..	..
" 17.....	46	45	..	..	44	40	..	42	..
" 18.....	47	46	..	..	..	..	..	..	..
" 19.....	46	46	44	44	..	..	44	..	40
" 20.....	47	47	..	..	..	..	..	..	..
" 21.....	47	47	..	..	44	42	..	42	..
" 22.....	47	48	..	..	..	..	..	..	..
" 23.....	47	47	46	46	..	..	46	..	..
" 24.....	45	46	..	..	..	..	..	..	..
" 25.....	46	45	..	..	44	41	..	42	42
" 26.....	46	46	..	..	..	..	..	..	..
" 27.....	47	47	46	46	..	..	46	..	..
" 28.....	..	..	..	..	..	..	..	..	..
" 29.....	..	..	..	..	..	..	..	..	..
" 30.....	47	46	..	..	..	..	..	..	..
" 31.....	45	45	..	..	44	39	..	42	..
Average....	47	46	45	45	46	41	45	42	40

Table Showing Range of Temperatures in Crude Sewage, Preparatory Tanks and Filtering Devices during the Winter

Date 1909	Sewage Crude	Septic Tank	Filter No. 1	Filter No. 2	Filter No. 3	Filter No. 4	Settling Basin No. 1	Settling Basin No. 2	Sand Filter No. 1
Feb. 1.....	47	46	..	..	..	..	..	..	40
" 2.....	47	46	44	45	..	..	44	..	..
" 3.....	47	46	..	..	..	.	..	..	..
" 4.....	47	..	..	..	..	..	..	..	..
" 5.....	46	46	.	..	44	43	..	..	..
" 6.....	44	46	..	..	..	..	..	..	..
" 7.....	46	44	44	44	..	..	44	..	..
" 8.....	46	46	..	..	..	..	..	..	..
" 9.....	46	46	..	..	43	41	..	..	..
" 10.....	46	46	..	..	..	..	..	..	..
" 11.....	46	46	44	44	..	..	44	..	..
" 12.....	46	46	..	..	..	..	..	..	40
" 13.....	47	46	..	..	44	42	..	42	..
" 14.....	45	45	..	..	..	..	..	..	..
" 15.....	46	45	44	44	..	..	44	..	..
" 16.....	45	45	..	..	..	..	..	..	..
" 17.....	45	45	.	..	43	40	..	42	..
" 18.....	46	46	..	..	..	..	..	..	40
" 19.....	47	46	44	44	..	..	44	..	..
" 20.....	41	..	..	..	..	..	..	.	..
" 21.....	42	41	..	..	41	38	..	40	..
" 22.....	45	43	..	..	..	..	..	..	..
" 23.....	..	..	..	..	..	..	..	..	..
" 24.....	..	..	..	..	..	..	..	..	40
" 25.....	..	..	..	..	..	..	..	..	..
" 26.....	..	..	..	..	..	..	..	..	..
" 27.....	45	..	..	..	..	..	..	..	..
" 28.....	44	44	43	43	..	..	43	..	..
Average.	45	45	44	44	43	41	44	41	40

Appendix S.

Methods of Analyses.

Methods of Analyses

The methods used in determining the various constituents of the sewage and effluents were in general those recommended by Laboratory Section of the American Public Association at their meeting in Havana, 1905, except where special conditions required some modification as hereinafter described. The Direct Process for determining Kjeldahl Nitrogen was used in the following form:

An amount of sample was taken for analysis so that when one-half of the digestate was neutralized and made up to 100 c. c. and 5 c. c. from this quantity diluted to 50 c. c. and nesslerized the reading would be between 3 and 6 on the standard tubes. After a few weeks the strength of a sample could be judged so that the quantity taken for analysis with the above dilutions would give readings within the range of the standards.

Nitrogen as Free Ammonia was also determined by the direct process by adding one drop of a 50% Caustic Soda Solution and three drops of a 10% Copper Sulphate solution to 100 c. c. of sample and shaking thoroughly. Usually 3 c. c. of the supernatant liquid, if care was used in removing the portion, gave a perfectly clear tube when nesslerized. In both the Kjeldahl and free ammonia determinations the nessler tube containing the nitrogen was shaken before nesslerizing.

Suspended matter was determined by the use of the Goosch Crucible method, a series of experiments having been conducted to show comparative results obtained by this and by the Platinum Method. The results of these tests as well as those relating to the determination of nitrogen are given in the following table. The average of all the samples analyzed by the two methods showed that the platinum method gave about 90% as much suspended matter as was found by the Gooch method.

The Method adopted for the determination of the Oxygen Consumed was that of boiling the sample of sewage for 5 minutes with an excess of potassium permanganate in an acid solution. It was realized at the beginning of the experiments that there was a tendency on the part of some to use the method of digesting the immersed sample in boiling water for 30 minutes, but a long series of experiments proved that duplicate determinations made upon the same sample by the boiling method gave results which were as comparable with each other as were those obtained by the 30 min. period of digestion. This latter method is particularly desirable where difficulty arises from "bumping," but under ordinary conditions the 5 min. boiling test was found to be as accurate and the manipulation much more simple. The results by the two methods appear in the following table of duplicate tests.

Results.

Parts per Million					
5 minute Boiling Method.		Difference	30 minute Immersion in Boiling Water.		Difference
1256	1288	32	1320	1368	48
32	36	04	46	46	00
252	248	04	268	280	12
184	188	04	212	204	08
38	40	02	40	42	02
320	316	04	336	332	04
196	200	04	240	244	04
38	42	04	50	50	00
640	664	24	690	704	08
308	312	04	340	348	08
320	304	16	328	332	06
182	184	02	206	208	02
664	664	00	720	712	08
632	632	00	688	688	00
432	436	04	476	484	08
Average Dif.................72			Average Dif.................79		

The results in columns marked, Oxygen Consumed, 5 min. cold test in various tables of analyses, were obtained by allowing the sample to stand 5 min. at room temperature with an excess of potassium permanganate in acid solution. At the end of 5 min. 1 c. c. of a 10% solution of potassium iodide was added and the excess of permanganate titrated with sodium thiosulphate. This is a comparatively simple determination and one that can be performed by the non-technical man who is often found in charge of small plants and in connection with the methylene blue test for putrescibility will throw much valuable light on the condition of effluents.

Methyl orange was used in determining alkalinity and the free lime was indicated by the phenolphthalein, titrating to a neutral end point with n/.50 sulphuric acid.

The nitrogen and fats in sludge were obtained by drying the wet sample at 212 degrees F., and then weighing out 0.5 gram for each analysis. After the sample for nitrogen had been digested until the oxidization was complete it was diluted and neutralized in the same way as the sample for nitrogen in the daily sewage analyses. Fats were extracted from the sludge by washing the dried sample with ether until practically all of the fat was removed and then boiling the residue with ether over steam until the film on the side of the dish showed no traces of fats. About 25 c. c. of ether were used for each analysis.

The changes in the method of sampling made to correspond with changes made in the rate of pumping sewage through the septic and settling tanks were based on a series of analyses made in December. These analyses showed that the samples made up of equal portions taken throughout the twenty-four hours were much weaker than those made up of portions taken in proportion to the flow. The results of these tests appear in Appendix 2.

Source of Sample	Comparison or Organic Nitrogen and Free Ammonia Results by the Direct and Distillation Methods.								Total Suspended Matter by the Direct (Goosch) and Indirect (Platinum) Methods.					
	Nitrogen (Organic).				Nitrogen Free Ammonia.				Total Suspended Matter				Residue on Evaporation Results Composite Day Samples 7 A. M.: 6 P. M.	
	Parts per Million			% Direct is of Distilled.	Parts per Million			% Direct is of Distilled.	Parts per Million			% Platinum is of Goosch	Parts per Million	
	Direct Process	Distillation	Difference		Direct Process	Distillation	Difference		Goosch Method	Platinum Meth.	Difference		Total	Dissolved
Crude Sewage Day Sample 7 A.M.-6 P.M...	18.6	19.9	1.2	94	17.4	17.4	0.0	100	259	230	29	81	1054	824
Crude Sewage 7 A.M.-6 P.M...	20.0	21.0	1.0	95	13.8	13.6	0.2	101	290	245	41	84	1086	841
Crude Sewage 7 A.M.-6 P.M...	‡8.8	8.4	0.4	105	15.5	15.4	0.1	101	292	251	41	86	1098	847
Crude Sewage 7 A.M.-6 P.M...	22.5	21.6	0.9	104	19.5	19.4	0.1	101	290	281	9	97	1125	844
Crude Sewage 9 A.M.........	16.8	17.3	0.5	97	10.3	9.6	0.7	107	283	255	28	90	1146	891
Crude Sewage 9 A.M.........	‡8.8	8.8	0.0	100	10.3	10.0	0.3	103	337	260	77	77	1217	957
Crude Sewage 7 A.M.-6 P.M...	26.4	27.5	1.1	96	11.0	10.7	0.7	103	296	256	40	86	1129	873
Crude Sewage 1 P.M.........	15.2	15.0	0.2	101	15.5	15.5	0.0	100	256	211	45	82	1059	848
Crude Sewage 10 A.M.........	31.6	31.0	0.6	102	13.0	13.1	0.1	99	260	235	25	90	1118	873
Crude Sewage 9 A.M.........	34.8	35.5	0.7	98	17.4	17.0	0.4	102	353	322	31	91	1242	920
Crude Sewage 7 A.M.-6 P.M...	25.8	25.4	0.4	102	....	....	...	...	328	299	29	91	1211	912

‡NOTE:—Organic nitrogen determined only in filtered samples on these two occaslons.

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